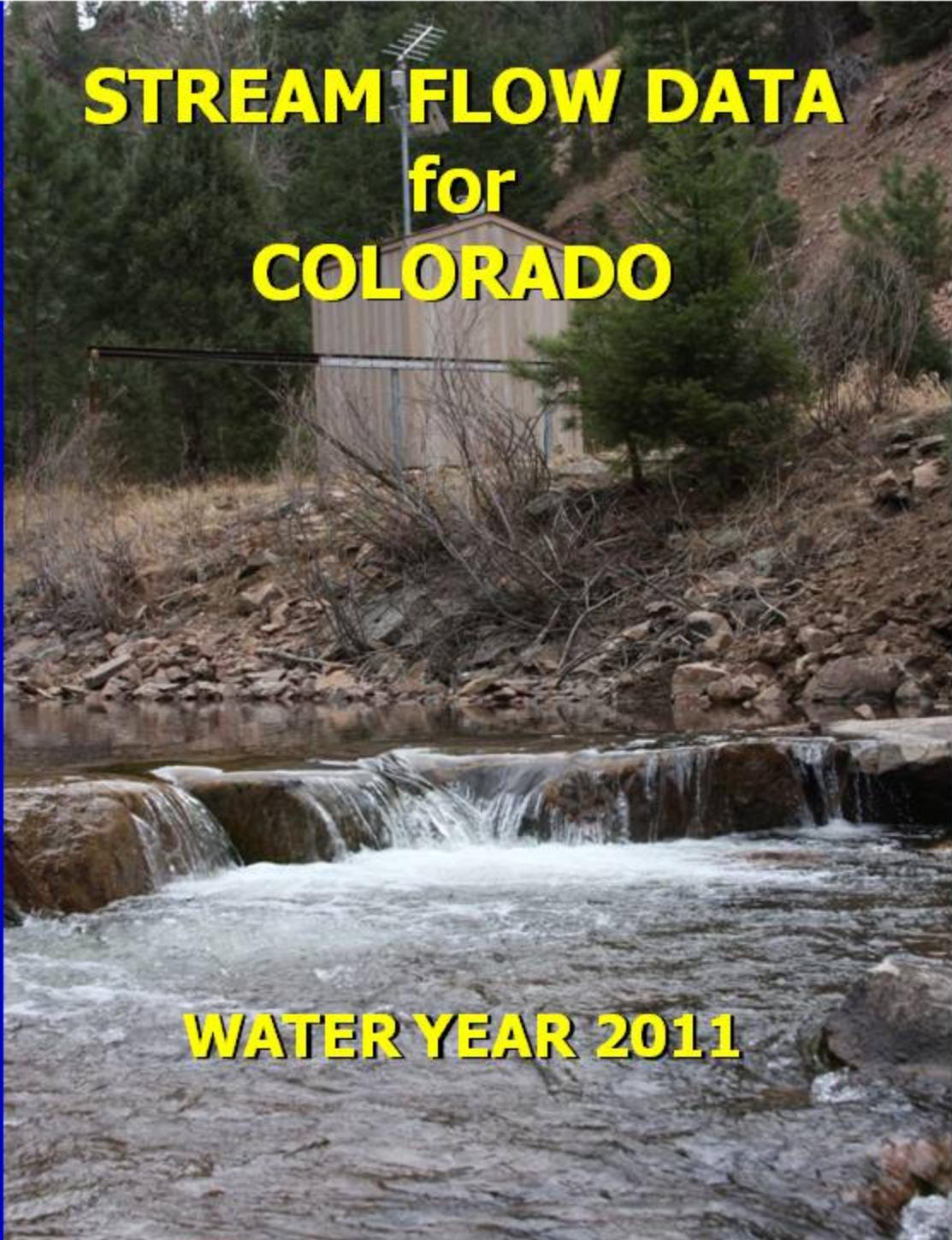




Compiled by
the Hydrographic
Branch

Edited by
Thomas Ley



COLORADO



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RESOURCES

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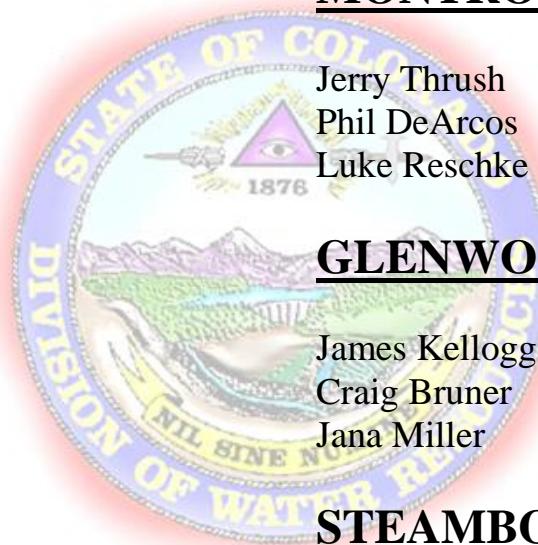
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STEAMBOAT SPRINGS

Dan Meyer
Dana Miller

DURANGO

Brian Boughton
Brian Leavesley



PLATTE RIVER BASIN
SOUTH PLATTE RIVER BELOW ANTERO RESERVOIR
Water Year 2011

Location.--	Lat. N38° 59' 37.96", Long. W105° 56' 40.31" (NAD83). Gage is located on the left side of a 10-ft Cipolletti Weir directly below Antero Reservoir.
Drainage Area and Period of Record.--	191 sqmi (USGS Colorado StreamStats utility). Daily values are available from the DWR from October 1, 1975 to present.
Equipment.--	Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink 2 satellite Data Collection Platform (DCP) with an independent standalone Sutron SDR-0001-1 in a concrete shelter over a 48 inch concrete stilling well at a 10 ft. sharp-crested stainless steel Cipolletti weir centered in a rectangular concrete wall within a concrete trapezoidal canal section. The well is connected to channel by two 4-inch intakes located at the same elevation. An electric tape gage located on a equipment shelf is the primary reference. There are no supplemental gage provisions. Gage is operated in cooperation of the Denver Water Board (DWB) and the Colorado Division of Water Resources (DWR). Facilities are owned and maintained by DWB.
Hydrologic Conditions.--	Controlled release from Antero Reservoir. Antero Reservoir captures water from approximately 191 sq mi of lands of varying topography and vegetation types.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data and 5-minute logged SDR data as back up. Regular visits ensure that the blade of the Cipolletti weir remained clean. No corrections were necessary after cleaning. Frequent visits by DWB and DWR staff ensured good instrument calibration. The record is complete and reliable. The large intakes (4 inch) transmit gage height (GH) fluctuation seen in the weir pool at higher stages. Base reference and instrument calibration checks can be somewhat dubious at stages above 1.50 feet.
Datum Corrections.--	Levels were run to the ETG on October 2, 2009 using R.M. 2 as base. The gage was found to be reading accurately.
Rating.--	The control is a 10 ft. sharp-crested stainless steel Cipolletti weir centered in a rectangular concrete wall within a concrete trapezoidal canal section. Flows can exceed the confines of the Cipolletti weir at which point the control becomes compound with the concrete walls functioning as a broad crested weir. Initially the weir employed a theoretic rating based on compound weirs. However, this proved inaccurate and a new rating, MOD10FTCIP was developed using the Cipolletti rating to a stage of 3.16 ft and discharge of 192 cfs. Above 3.16 ft. the rating is defined to 316 cfs by measurements made in 2002 and 2003. This rating was utilized for 2011. By agreement with DWB, when flows are confined to the Cipolletti portion of the rating, the rating is applied directly to the gage height record to compute flow. The accuracy of the Cipolletti portion of the weir is thought (by Denver) to be more accurate than conventional measurements made in a natural channel. No discharge measurements were made this year. However, once above GH's of about 3.16 ft, the rating is based on a few measurements with only fair accuracy due to surging GH conditions. Currently there is no suitable location to measure higher flows. The measurement bridge over the stilling pool is not usable due to eddies and extreme turbulence in the pool during high releases. The peak discharge of 156 cfs occurred at 2030 on June 10, 2011 at a gage height of 2.78 ft. with a shift of 0.00 ft.
Discharge.--	Shifts could be caused by moss growth and approach velocities. By agreement with the DWD, the rating was applied directly to gage heights. Flow is controlled by low head slide gates which are prone to blockage by debris, causing spikes in flow until the material breaks free or is flushed out by caretaker opening the gate. All flows this WY were contained within the Cipolletti portion of the compound weir. For flows above the Cipolletti, some combinations of gate operation and outlet size choice produce highly turbulent flow conditions which are very difficult to rate (i.e., measurement GH's with high degree of uncertainty/variability and lack of suitable measurement section/conditions).
Special Computations.--	The MOD10FTCIP rating was renamed to PLAANTCO01 to match rating nomenclature standards in CoHMS. PLAANTCO01 was used for the record.
Remarks.--	The record is rated as fair due to lack of confirming measurements. The record will be rated fair until confirming discharge measurements can be made throughout the range of flows experienced. Station maintained and record developed by Mike Wild.
Recommendations.--	Due to limitations and or issues associated with performing conventional current meter measurements at this site, investigation and evaluation of the weir's rating by use of an Acoustic Doppler Current Profiler (ADCP) should be considered. However, site condition suitability for ADCP use has not been evaluated as of yet, and excessive air entrainment introduced by the baffle structure located in the weir pool may preclude ADCP use. Alternatively, use of an in situ Acoustic Doppler Velocity Meter (ADVM) should be evaluated.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SOUTH PLATTE RIVER BELOW ANTERO RESERVOIR

RATING TABLE-- PLAANTCO01 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

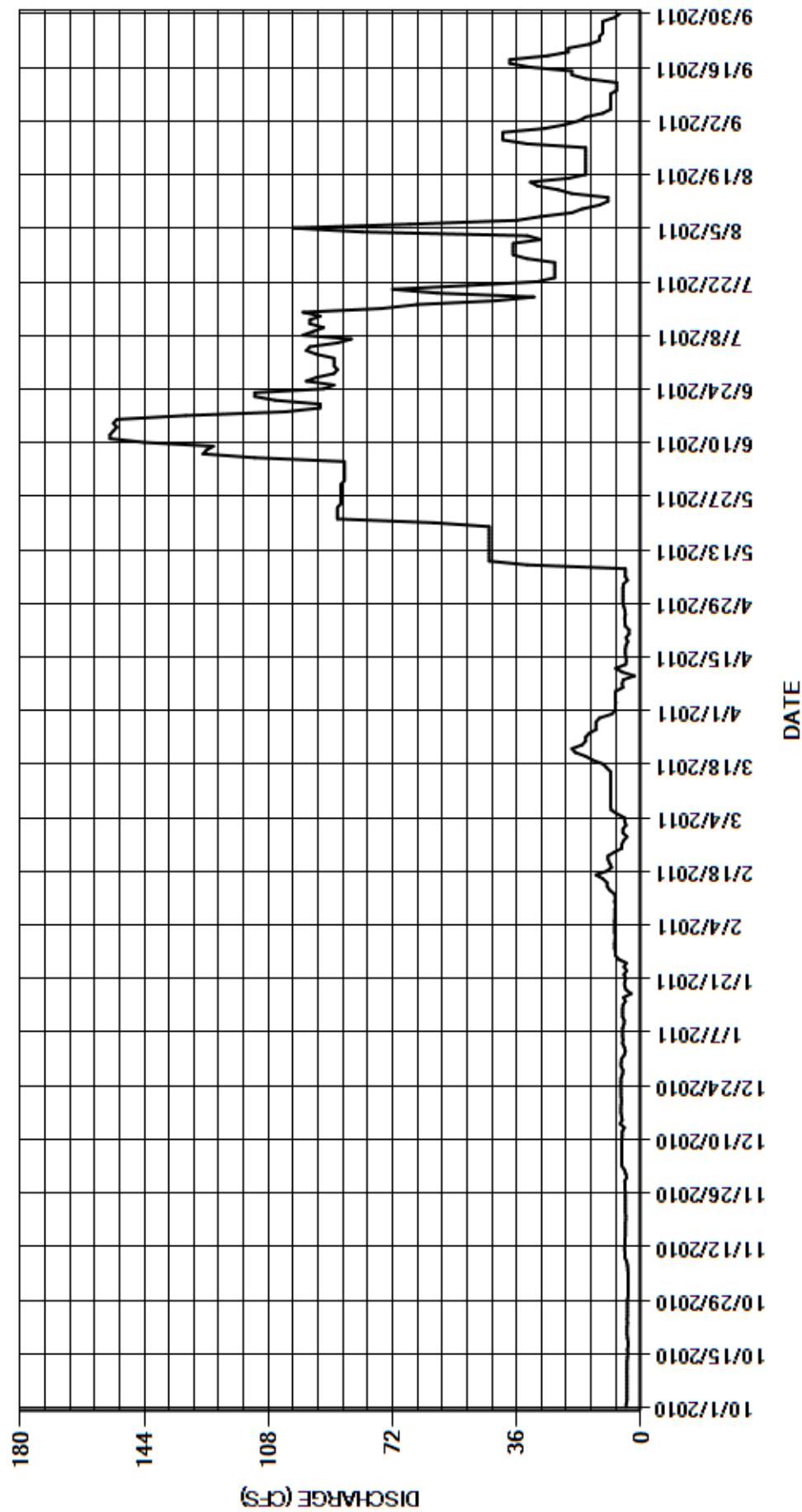
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.2	3.7	4.4	4.8	7.4	5.2	7.4	5.2	86	89	37	22
2	4.2	3.7	4.8	4.5	7.6	4.3	7.4	5.2	86	89	29	18
3	4.0	3.7	5.5	4.8	7.6	4.7	7.3	5.2	86	94	33	16
4	4.0	3.7	5.5	5.3	7.6	4.8	7.4	5.0	86	97	81	11
5	4.0	3.7	5.5	5.2	7.6	7.0	7.4	3.9	86	96	101	8.8
6	4.0	3.8	5.5	5.3	7.5	8.6	7.3	4.5	112	88	67	8.8
7	4.0	3.9	5.5	5.3	7.5	8.8	5.2	4.5	127	84	36	8.8
8	4.0	4.1	5.5	5.3	7.5	8.8	5.4	4.5	126	98	29	8.8
9	4.0	4.6	5.5	4.9	7.3	8.8	5.1	33	124	95	20	8.8
10	4.1	4.6	5.5	4.8	7.6	8.8	1.8	44	144	92	17	7.0
11	4.0	4.7	5.4	5.3	7.4	8.8	5.4	44	154	96	12	7.0
12	4.0	4.7	5.4	5.3	7.6	8.8	7.3	44	154	96	9.5	7.0
13	4.0	4.6	4.8	5.3	9.0	8.8	4.4	44	153	93	9.5	16
14	3.9	4.6	6.0	5.2	9.8	8.8	4.2	44	152	98	20	20
15	3.8	4.5	5.4	4.5	9.8	8.8	4.4	44	153	75	24	20
16	3.9	4.5	5.6	5.0	11	8.8	4.5	44	152	65	30	32
17	3.7	4.5	5.8	2.8	13	9.9	4.5	44	132	42	32	38
18	3.7	4.5	5.8	4.3	9.9	11	4.3	44	103	31	21	38
19	3.9	4.4	5.7	4.7	8.5	14	3.8	44	93	59	16	27
20	4.0	4.4	5.6	4.7	9.0	16	4.3	60	93	72	16	21
21	4.0	4.5	5.7	4.4	9.5	19	3.4	88	106	50	16	21
22	4.0	4.5	5.7	4.9	9.5	20	3.4	88	112	30	16	15
23	3.9	4.5	5.7	4.1	7.6	17	4.5	88	112	25	16	12
24	4.0	4.5	5.8	4.9	5.5	16	4.6	88	92	25	16	12
25	3.9	4.5	5.8	4.2	5.5	16	4.7	87	89	25	16	11
26	3.9	4.5	5.7	6.5	5.0	15	4.5	87	97	25	16	11
27	3.9	4.6	5.3	7.4	4.0	13	4.6	87	94	25	33	11
28	3.9	4.6	5.2	7.4	5.2	13	4.9	87	89	33	40	11
29	3.9	4.7	5.7	7.6	---	13	5.2	87	88	37	40	7.6
30	3.7	4.1	5.7	7.6	---	12	5.2	87	89	37	40	6.1
31	3.7	---	5.6	7.5	---	8.5	---	86	---	37	28	---
TOTAL	122.2	129.9	170.6	163.8	222.0	336.0	153.8	1531.0	3370	1998	917.0	461.7
MEAN	3.94	4.33	5.50	5.28	7.93	10.8	5.13	49.4	112	64.5	29.6	15.4
AC-FT	242	258	338	325	440	666	305	3040	6680	3960	1820	916
MAX	4.2	4.7	6.0	7.6	13	20	7.4	88	154	98	101	38
MIN	3.7	3.7	4.4	2.8	4.0	4.3	1.8	3.9	86	25	9.5	6.1
CAL YR	2010	TOTAL	8253.5	MEAN	22.6	MAX	136	MIN	2.8	AC-FT	16370	
WTR YR	2011	TOTAL	9576.0	MEAN	26.2	MAX	154	MIN	1.8	AC-FT	18990	

MAX DISCH: 156 CFS AT 20:30 ON JUN 10,2011 GH 2.78 FT SHIFT 0 FT

MAX GH: 2.78 FT AT 20:30 ON JUN 10,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH PLATTE RIVER BELOW ANTERO RESERVOIR
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06694920 SOUTH PLATTE RIVER ABOVE SPINNEY RESERVOIR
Water Year 2011

Location.--	Lat. N38° 59' 48.59", Long. W105° 40' 50.48" (NAD83). Gage is located on the left side of a 25-ft. Parshall Flume 0.7 mi above Spinney Reservoir and 6.5 miles SE of Hartsel, CO in Park County, CO.
Drainage Area and Period of Record.--	668 sq. mi. (From USGS StreamStats utility). Daily values are available from the DWR from October 1, 1982 to present.
Equipment.--	Digital incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink 2 Data Collection Platform (DCP) and a stand-alone Sutron SDR-0001-1 data logger in a 6-ft. by 8-ft. wooden shelter overtop a 3-ft. by 5-ft. concrete stilling well at a 25-ft. Parshall Flume. An electric tape gage placed on the instrument shelf serves as the primary reference with a supplemental staff gage on the right wing wall of the flume at the Ha location. Elevation of gage is 8,700 ft. (from topographic map).
	The gage and satellite monitoring equipment are owned and maintained by the City of Aurora. Aurora operates the gage seasonally. Colorado Division of Water Resources (DWR) operates the gage for record purposes and is paid by Aurora to provide real time data.
Hydrologic Conditions.--	Regulated and unregulated flows from areas of varying topography and vegetative type. Flows can be affected by operations at Antero and Montgomery Reservoirs and irrigation diversion upstream of the gage.
Gage-Height Record.--	The primary record is 15 minute telemetered data with 15-minute logged DCP and SDR data as backup. The record is complete and reliable, except as follows: October 30, 31, November 4-7 and 11, 2010 and April 16, 2011 when the stage-discharge relationship was affected by ice; November 12, 2010 and April 5, 2011 which are partial day records corresponding to shut-down and start-up of the gage. The gage was off for winter from November 12, 2010 to April 5, 2011. Instrument calibration was supported by thirty-one visits gage. Two shaft encoder adjustments were necessary during the operational period of the water year; one on April 4, 2010 (0.01 ft.) and the other on August 10, 2011 (-0.01 ft.).
Datum Corrections.--	Levels were run on October 13, 2011 using the flume's crest as a base. The RP was found to be set accurately. Reference Marks (RM) Nos. 1 and 2 were established on this date.
Rating.--	The control is a 25-foot Parshall Flume. STD25FTP, a standard Parshall Flume rating was continued in use of all of WY2011. High flows have been observed to by-pass the flume by leaving the channel and crossing the access road. This is believed to occur at gage heights greater than 4.00 ft. and at flows in the 1000 cfs range. The rating is well defined to 572 cfs by measurements made since 2001. Wading measurements are made downstream of the foot bridge (measurement section width 30.5 ft.) while section rod and cable measurements are made on upstream side (measurement section width 32.1 ft.). Bridge is indexed on both sides to obtain accurate section widths. Thirteen measurements (Nos. 303 - 315) were made during the water year ranging in discharge from 21.6 to 572 cfs covering the range in flow experienced this year well. The peak flow of 609 cfs occurred at 1045 on July 13, 2011 at a gage height of 3.13 ft. with a shift of 0.07 ft. exceeding the high flow measurement (No. 311) made July 11, 2011 by 37 cfs and 0.12 ft. of stage respectively.
Discharge.--	Shifts can be caused by algal growth in the flume and by deposition and scour of bed material above the flume. Stage dependent shifting was used for all periods of good record. Variable shift table PLASPICOVST11-1, applied from October 1, 2010 to the peak event on July 13, 2011 and again from September 14 to 30, 2011 is defined by twelve measurements (Nos. 302-311, 315 and 316) made during the periods of use. Variable shift table PLASPICOVST11-2, applied from July 13 to August 10, 2011 is defined by three measurements (Nos. 311-313) made during the period of use. All measurements were give full weight except for No. 316 which was adjusted -2.5% from a computed shift of -0.01 ft. to 0.00 ft. From August 10 to September 14, 2011 PLASPICOVST11-2 was prorated by time to PLASPICOVST11-1.
Special Computations.--	Ice affected days were estimated from adjacent good record with respect to temperature trends recorded at the PLAHAARCO gage. The winter estimates (gage closed) were taken from Aurora's Spinney Mountain Reservoir accounting. These figures are based on reservoir elevation readings, and tend to show step-wise changes. DWR cannot confirm accuracy of daily accounting.
Remarks.--	The record is rated good, except for days of ice affect, partial day records or winter estimated days which are estimated and poor. Station maintained and record developed by Mike Wild.
Recommendations.--	Levels need to be run in the 2012 Water Year to verify establishment of RM's 1 and 2.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06694920 SOUTH PLATTE RIVER ABOVE SPINNEY RESERVOIR

RATING TABLE.-- STD25FTP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

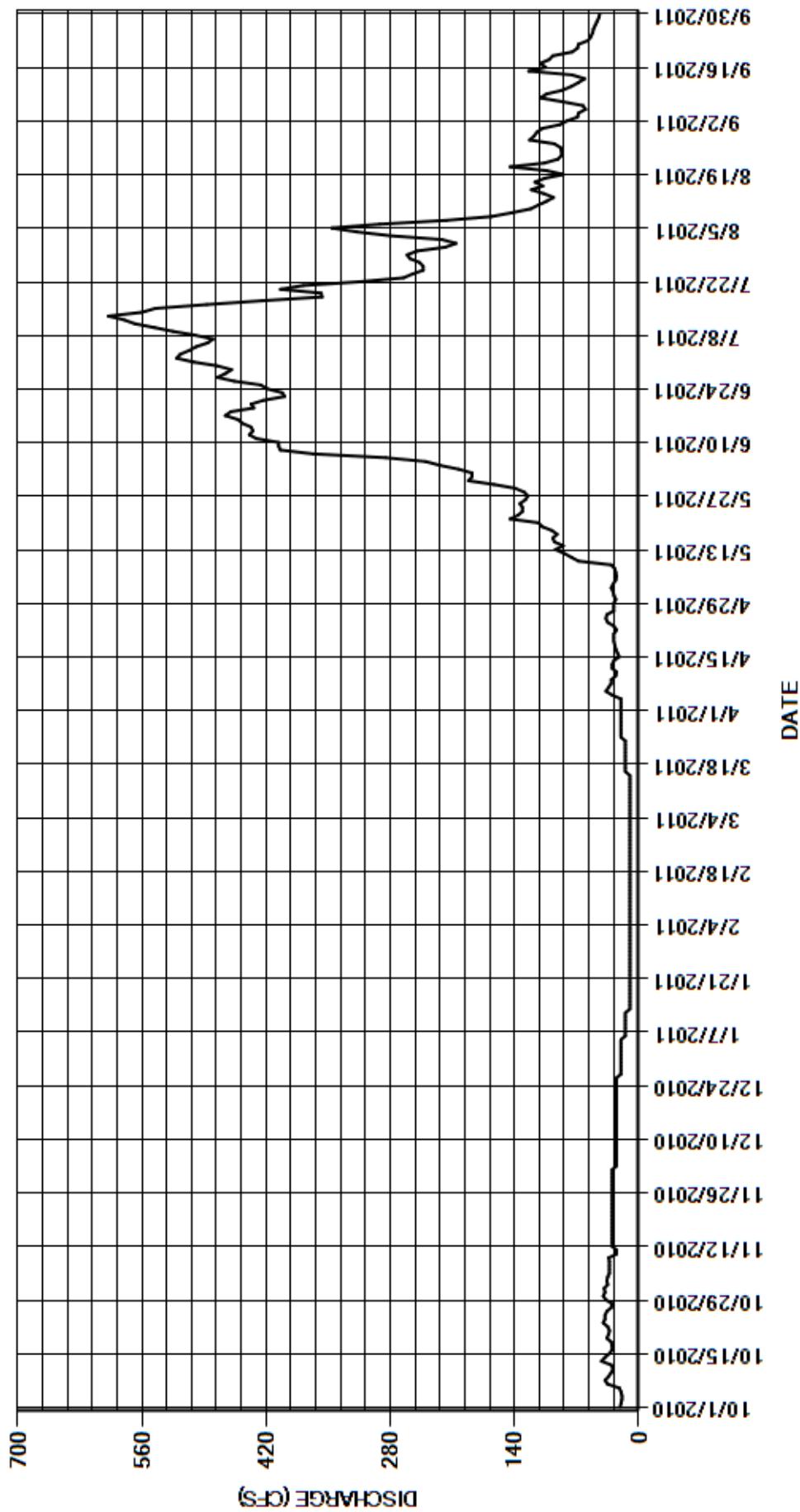
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	21	39	e30	e20	e10	e10	e20	28	188	502	206	89
2	20	35	e30	e20	e10	e10	e20	29	188	521	222	81
3	19	36	e25	e20	e10	e10	e20	31	203	517	280	69
4	19	e35	e25	e20	e10	e10	e20	29	224	507	318	68
5	20	e33	e25	e20	e10	e10	e30	26	240	499	346	60
6	22	e33	e25	e15	e10	e10	37	25	285	486	292	63
7	35	e33	e25	e15	e10	e10	34	26	367	480	217	86
8	38	33	e25	e15	e10	e10	31	27	404	500	166	111
9	34	34	e25	e15	e10	e10	31	31	406	525	143	104
10	31	25	e25	e15	e10	e10	26	68	406	546	122	86
11	29	e25	e25	e15	e10	e10	25	76	431	568	113	76
12	31	e30	e25	e15	e10	e10	30	84	439	580	104	68
13	42	e30	e25	e10	e10	e10	30	94	435	598	96	61
14	38	e30	e25	e10	e10	e10	28	85	437	560	107	75
15	33	e30	e25	e10	e10	e10	22	95	447	545	121	124
16	30	e30	e25	e10	e10	e15	e24	97	452	487	108	105
17	30	e30	e25	e10	e10	e15	26	92	466	425	117	111
18	31	e30	e25	e10	e10	e15	27	98	460	357	106	101
19	36	e30	e25	e10	e10	e15	28	109	434	358	85	97
20	34	e30	e25	e10	e10	e15	28	113	437	404	104	75
21	33	e30	e25	e10	e10	e15	28	145	423	378	145	69
22	35	e30	e25	e10	e10	e15	25	136	399	313	106	68
23	40	e30	e25	e10	e10	e15	28	131	402	265	91	57
24	38	e30	e25	e10	e10	e15	35	131	419	255	87	54
25	38	e30	e25	e10	e10	e20	37	134	426	243	87	52
26	36	e30	e25	e10	e10	e20	36	128	456	243	88	51
27	31	e30	e20	e10	e10	e20	28	125	475	247	95	49
28	30	e30	e20	e10	e10	e20	28	129	466	258	123	47
29	37	e30	e20	e10	---	e20	28	139	459	261	118	45
30	e40	e30	e20	e10	---	e20	26	163	475	250	115	44
31	e38	---	e20	e10	---	e20	---	192	---	218	109	---
TOTAL	989	931	760	395	280	425	836	2816	11749	12896	4537	2246
MEAN	31.9	31.0	24.5	12.7	10.0	13.7	27.9	90.8	392	416	146	74.9
AC-FT	1960	1850	1510	783	555	843	1660	5590	23300	25580	9000	4450
MAX	42	39	30	20	10	20	37	192	475	598	346	124
MIN	19	25	20	10	10	10	20	25	188	218	85	44
CAL YR	2010	TOTAL	31438	MEAN	86.1	MAX	527	MIN	10	AC-FT	62360	
WTR YR	2011	TOTAL	38860	MEAN	106	MAX	598	MIN	10	AC-FT	77080	

MAX DISCH: 609 CFS AT 10:45 ON JUL 13,2011 GH 3.13 FT SHIFT 0.07 FT

MAX GH: 3.13 FT AT 10:45 ON JUL 13,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06694920 SOUTHPLATTE RIVER ABOVE SPINNEY RESERVOIR
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06695000 SOUTH PLATTE RIVER ABOVE ELEVENMILE RESERVOIR
Water Year 2011

Location.--	Lat. 38°58'03", Long. 105°34'51", in NE ¼ sec. 32, T.12 S., R.73 W., Park County, Hydrologic Unit 10190001, on left bank 200 ft downstream from highway bridge, 2.5 mi upstream from water line of Elevenmile Canyon Reservoir, at elevation 8,561 ft. and 13 mi southeast of Hartsel.
Drainage Area and Period of Record.--	880 mi ² ; 1933 to present.
Equipment.--	Digital incremental Sutron 56-0540-400-DTR shaft encoder, electronic temperature gage and a tipping bucket rain gage connected to a Sutron SatLink2 Data Collection Platform (DCP) and a standalone Sutron SDR-0001-1 incremental shaft encoder in a wooden shelter overtop a concrete Ha / Hb stilling well at a 25-foot Parshall Flume. Submergence is not an issue. An electric tape gage placed on the instrument shelf is the primary reference with a supplemental staff gage located on the right wing wall of the flume at the Ha location. Gage ownership is unknown. The Colorado Division of Water Resources reconstructed the gage shelter in the 2011 Water Year and owns all instrumentation. The gage appears to be on Denver Water property and has markers suggesting Denver Water constructed the gage but sits adjacent to lands owned by the City of Aurora.
Hydrologic Conditions.--	Controlled release. The gage is approximately two miles below Spinney Mountain Reservoir. Flows are controlled by Spinney operations. A small unregulated drainage is intercepted by the river between Spinney and the gage which at times can contribute significant flow during localized events. The record is generally flat showing stepwise changes. At extreme release rates (1,000+ cfs) water can enter a bypass channel and bypass the flume. This was last observed in 1995.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP and SDR data as backup. Instrument calibration was maintained by thirty-two visits to the gage. One instrumentation correction of 0.02 ft. was applied to the record. The cause of the instrument correction is assumed to be leaking of ISOPAR (an anti-freezing agent) from the oil cylinder during a low stage period in February, 2011. The correction was applied by stage and as defined by observations made during the period. The primary record agreed with SDR data within 0.02 ft. all year. The record is complete and reliable except for: November 22-30, December 6 and 8, 2010 and February 7-10, 2011 when the stage discharge relation was affected by ice. Due to the gage's proximity to Spinney Mountain Reservoir, ice accumulation is generally not an issue. However, when winter releases are below 100 cfs ice can affect the gage in two ways; Ice jams upstream of the gage can cause a drop in flow followed by surges as the ice dam lets loose or overtops, and by accumulation of ice on the flume walls below the normal stage level. Generally these operate in conjunction with each other and can compound the degree of ice effect. Algal growth in the flume can affect the flume's performance. Moderate to heavy algal growth was noted throughout the year. The flume was cleaned on March 29, 2011 with no change in stage following the cleaning. Measurements Nos. 881-886 were made under heavy to moderate algal growth conditions. Flume entry for cleaning purposes was prohibitory during this period due to stage.
Datum Corrections.--	Levels were run to the electric tape gage on October 12, 2011 using R.M. 3 as base. The gage was found within allowable limits of 0.02 ft. No correction was required nor made.
Rating.--	The control is a 25-foot Parshall Flume. Movement of cobble, gravel and silt and development of a sand bar above the flume as well as vegetal growth in the flume cause shifts. STD25FTP, a standard 25-foot Parshall Flume rating was continued in use for all of WY2011. Seventeen discharge measurements (Nos. 872-889) were made during the year ranging in discharge from 46.1 to 538 cfs covering the range in stage experienced this year well except for higher daily discharges occurring on July 2-7, 2011. The peak flow of 576 cfs occurred at 2300 on July 4, 2011 at a gage-height of 3.05 ft. with a shift of +0.04 ft. exceeding the high flow measurement (No. 884) made June 28, 2011 by 38 cfs and 0.13 ft of stage respectively.
Discharge.--	Shifting control method was used for all periods of open water. Stage dependent shifting was used from October 18, 2010 through May 3, 2011 and again from August 29, 2011 through the end of water year using variable shift table PLAHCARCOVST11-A. PLAHCARCOVST11-A is defined by eleven measurements (Nos. 873-880 and 888-890) made during the periods of use. Shifts were applied by time with consideration given to change in stage for all other periods. Measurements made this year showed unadjusted shifts varying between -0.03 to 0.05 ft. All were given full weight except for Nos. 873, 878-880, 882 and 883 which were adjusted up to 2.5% to smooth shift distributions.
Special Computations.--	Discharge for ice affected periods was estimated from adjacent good record and Spinney Mountain Reservoir operating reports.
Remarks.--	The record is good, except for periods of ice effect which are estimated and air. Station maintained and record developed by Mike Wild.
Recommendations.--	An additional reference point should be established the next time levels are run. The existing rating maximum gage height is 6 ft. The flume walls and gage are to 8 ft. Consider rating table extension.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06695000 SOUTH PLATTE RIVER ABOVE ELEVENMILE RESERVOIR

RATING TABLE-- STD25FTP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

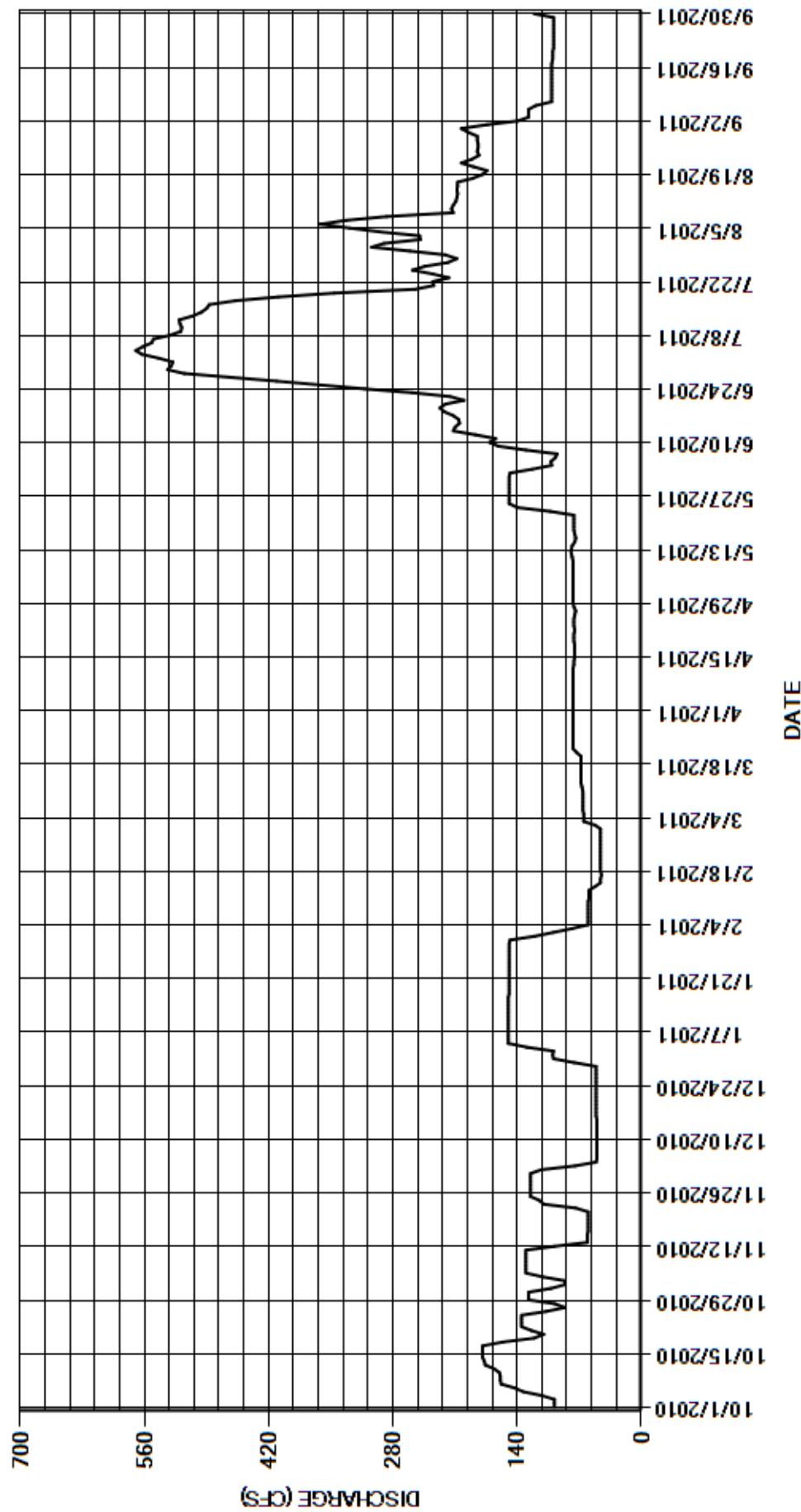
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	98	102	125	100	120	46	77	77	149	528	290	174
2	98	86	113	99	99	52	77	77	148	544	249	139
3	98	86	75	129	78	65	77	77	123	563	250	127
4	112	111	51	150	60	65	77	77	101	570	295	127
5	133	130	50	150	60	65	77	77	102	562	329	127
6	143	130	e50	150	60	66	77	77	97	552	362	119
7	158	130	50	150	e60	66	77	77	95	550	333	101
8	159	130	e50	150	e60	66	77	77	130	531	287	101
9	159	130	50	150	e60	66	77	77	161	519	212	101
10	160	130	50	150	e60	66	77	77	171	518	214	101
11	166	130	50	150	59	66	77	78	164	520	212	101
12	176	98	50	150	59	67	77	79	187	521	209	101
13	177	61	50	150	59	68	76	79	212	506	208	101
14	179	61	50	150	52	68	76	78	210	496	207	101
15	179	61	50	150	46	68	75	75	205	490	208	101
16	179	60	51	150	46	68	75	74	206	487	207	101
17	179	60	51	149	45	68	75	75	212	458	207	101
18	156	60	51	149	46	68	75	76	222	409	190	100
19	121	60	51	149	46	68	76	76	227	346	179	100
20	110	60	51	149	46	68	76	76	221	255	174	100
21	124	60	51	149	46	73	76	76	200	234	189	99
22	135	e74	51	149	46	77	75	76	216	235	203	99
23	135	e110	51	149	46	77	76	103	258	217	191	99
24	135	e115	51	149	46	77	76	140	312	235	183	99
25	135	e125	51	149	46	77	76	149	361	258	185	99
26	107	e125	51	149	46	77	75	149	411	244	184	99
27	86	e125	51	149	46	77	74	149	463	218	184	99
28	98	e125	51	149	46	77	76	149	515	208	185	99
29	127	e125	51	149	---	77	77	149	534	221	185	99
30	127	e125	76	149	---	77	77	149	530	261	195	121
31	127	---	99	148	---	77	---	149	---	304	203	---
TOTAL	4276	2985	1803	4512	1589	2143	2286	2974	7143	12560	6909	3236
MEAN	138	99.5	58.2	146	56.8	69.1	76.2	95.9	238	405	223	108
AC-FT	8480	5920	3580	8950	3150	4250	4530	5900	14170	24910	13700	6420
MAX	179	130	125	150	120	77	77	149	534	570	362	174
MIN	86	60	50	99	45	46	74	74	95	208	174	99
CAL YR	2010	TOTAL	44203	MEAN	121	MAX	427	MIN	35	AC-FT	87680	
WTR YR	2011	TOTAL	52416	MEAN	144	MAX	570	MIN	45	AC-FT	104000	

MAX DISCH: 576 CFS AT 23:00 ON JUL 04,2011 GH 3.05 FT SHIFT 0.04 FT

MAX GH: 3.05 FT AT 23:00 ON JUL 04,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06695000 SOUTHPLATTE RIVER ABOVE ELEVENMILE RESERVOIR
WY2011 HYDROGRAPH



PLATTE RIVER BASIN

06696000 SOUTH PLATTE RIVER NEAR LAKE GEORGE

Water Year 2011

Location.--	38°54'19.59"N 105°28'24.07"W Referenced from Google Earth (WGS 84) Park County, Hydrologic Unit 10190001, on left bank 700 ft downstream from Elevenmile Canyon Reservoir and 8.05 mi southwest of town of Lake George.
Drainage Area and Period of Record.--	963 mi ² . October 1929 to current year. Monthly data only for some periods.
Equipment.--	Digital incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink 2 Data Collection Platform (DCP) and a stand-alone Sutron SDR-0001-1 data logger in a concrete shelter at a 15-foot concrete Parshall Flume. A 10-foot rectangular bypass channel is located adjacent to the Parshall Flume on the right side. The bypass channel can become active at a gage-height of 3.40 ft. but is normally kept closed by stop logs. An adjustable reference point and metal drop tape serve as the primary reference with a supplemental staff gage located on the right wing wall of the flume at the Ha location. The gage is owned and operated by Denver Water in cooperation with the Colorado Division of Water Resources.
Hydrologic Conditions.--	Semi-controlled release. Eleven Mile Reservoir (97,780 AF) is immediately upstream from the gage, regulating flows. Eleven Mile Reservoir also has a spillway which can be active for extended periods of time. When the spillway is active abrupt gage-height changes are experienced at this gage due to wave action over the spillway. Spinney Mountain Reservoir (53,651 AF) and Antero Reservoir (22,300 AF) are located upstream of Eleven Mile Reservoir and can operationally affect hydrologic conditions at this gage. Discharge changes can occur in a stepwise fashion as releases are made from the outlet works to control water temperature for fish habitat.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP and SDR data as backup. Instrument calibration was maintained by 17 visits made to the gage. One correction of -0.01 ft was applied as defined by visits made to the gage. The daily averages of primary record agreed with daily averages of the SDR record within 0.02 ft. all year. The record is complete and reliable except for one missing value on September 30, 2011 which was interpolated from adjacent good record without loss of accuracy.
	The shelter and stilling well are heated in winter months to keep the well open. Accuracy is not affected and ice accumulation was not noted this year. Algal growth in the flume can affect the flume's performance. The flume was cleaned on April 15 and September 14, 2011. The April 15 cleaning did not return a notable cleaning correction; however, the September 14 cleaning resulted in a cleaning correction of -0.02 ft.
Datum Corrections.--	Levels were run on August 8, 2010 using RM4 as a base. The RP was found to be 0.004 ft low. The RP was not corrected.
Rating.--	Flow was confined to the Parshall Flume section all year. The control is a 15-foot Parshall Flume. STD15FTPF, a standard 15-foot Parshall Flume rating was continued in use for all of WY2011. Eighteen measurements (Nos. 1104-1121) were made during the year ranging in discharge from 48.5 to 509 cfs. Measurements made this year cover the range in stage experience well. The peak flow of 544 cfs occurred at 1615 on July 9, 2011 at a gage-height of 4.01 ft. with a shift of +0.05 ft. exceeding the high flow measurement (No. 1116) by 35 cfs and 0.17 ft. of stage respectively. A rating for the bypass structure was developed in 1995.
Discharge.--	Shifts are caused by abnormal and constricted approach conditions, deterioration of the flume surfaces and vegetal growth in the flume. Shifting control method was used for the entire year. Shifts were distributed by stage from October 1, 2010 to February 14, 2011 using variable shift table PLAGEOCOVST11-A defined by 7 measurements (Nos. 1103-1109) made during the period of use. Shifts were applied by time from February 14, 2011 to May 5, 2011 as defined by measurements. From May 5 to August 23, 2011 shifts were distributed by stage using variable shift table PLAGEOVST11-B defined by 8 measurements (Nos. 1112-1119) made during the period of use. From August 23 to October 3, 2011 shifts were distributed by time as defined by measurements. Open water measurements showed shifts varying between -0.03 and +0.05 ft. All were given full weight except for Nos. 1106-1109, 1112, 1118 and 1119 which were adjusted up to 3% to smooth shift distributions.
Special Computations.--	None.
Remarks.--	The record is good. Station maintained and record developed by Mike Wild.
Recommendations.--	Approach conditions cause velocities to be greater than 0.50 ft/s in the stilling pool immediately upstream of the flume. This could be abated if the stilling pool were cleared of accumulated cobble and gravel. An area of concrete spalling was noted following the 2011 water year. It appears to be confined to the lower vertical walls below the crest on the left edge water (LEW) side. The spalling did not affect the performance of the structure in the 2011 water year but needs to be monitored and possibly scheduled for repairs. The onsite Denver Water caretakers have been made aware of the issue.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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06696000 SOUTH PLATTE RIVER NEAR LAKE GEORGE

RATING TABLE.-- STD15FTP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

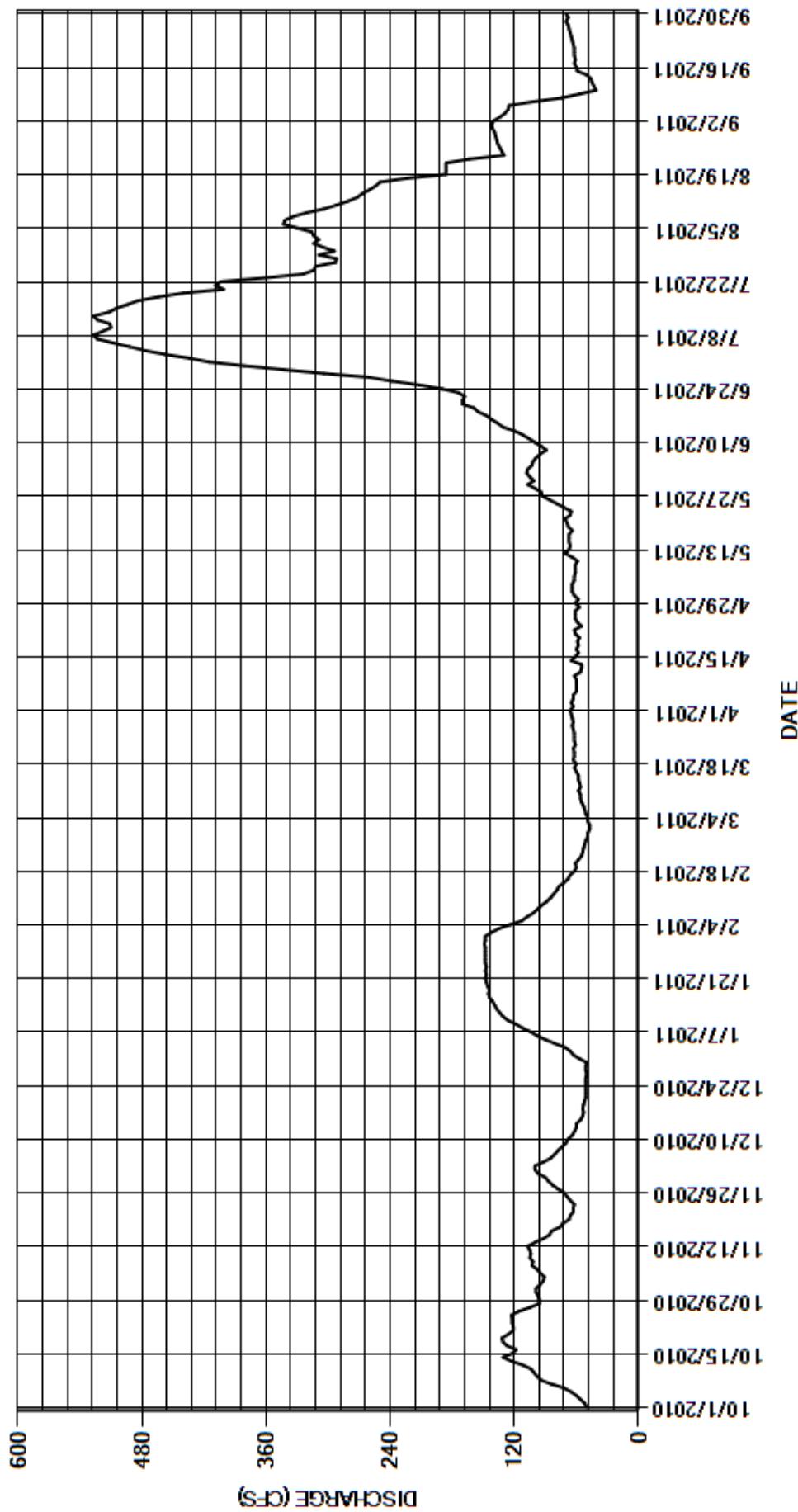
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	50	99	97	63	148	47	66	62	105	415	314	142
2	52	95	100	66	142	47	63	64	108	434	309	140
3	56	92	100	71	135	49	65	64	107	458	314	134
4	60	91	92	81	124	49	63	64	103	477	316	129
5	65	95	85	90	113	51	63	62	102	492	330	126
6	72	98	81	98	108	52	60	62	99	508	343	125
7	84	103	78	104	102	53	60	61	95	523	342	102
8	94	102	74	112	98	55	60	61	89	527	334	74
9	98	105	70	118	94	56	60	61	94	518	321	57
10	101	104	68	126	89	56	62	59	100	510	304	41
11	104	105	64	131	85	58	56	64	106	511	292	43
12	112	107	62	134	82	56	55	71	112	523	281	45
13	123	100	60	137	79	57	55	67	120	527	272	46
14	131	92	60	139	77	58	65	66	131	512	267	50
15	122	86	56	141	72	58	61	67	136	505	260	59
16	118	84	54	144	68	60	58	67	142	494	254	60
17	127	76	53	145	66	62	60	67	147	484	250	62
18	131	73	54	144	62	60	58	64	155	464	224	61
19	132	67	53	146	60	63	59	68	159	440	186	62
20	126	66	52	147	61	62	57	69	170	401	186	62
21	121	63	51	148	58	62	61	71	170	409	186	62
22	121	63	51	147	55	63	62	66	168	404	186	63
23	122	62	51	148	54	61	55	65	174	360	164	64
24	122	66	51	147	53	62	59	72	190	324	130	65
25	123	69	51	148	52	62	61	79	212	314	132	66
26	116	72	51	148	51	62	61	86	238	312	134	67
27	105	78	50	148	49	63	61	93	260	293	136	68
28	96	83	51	148	49	64	57	94	304	292	137	70
29	96	87	51	148	---	63	61	100	343	309	138	68
30	97	90	50	149	---	64	58	107	381	294	139	70
31	99	---	57	148	---	65	---	101	---	305	141	---
TOTAL	3176	2573	1978	3964	2286	1800	1802	2224	4820	13339	7322	2283
MEAN	102	85.8	63.8	128	81.6	58.1	60.1	71.7	161	430	236	76.1
AC-FT	6300	5100	3920	7860	4530	3570	3570	4410	9560	26460	14520	4530
MAX	132	107	100	149	148	65	66	107	381	527	343	142
MIN	50	62	50	63	49	47	55	59	89	292	130	41
CAL YR	2010	TOTAL	41365	MEAN	113	MAX	402	MIN	47	AC-FT	82050	
WTR YR	2011	TOTAL	47567	MEAN	130	MAX	527	MIN	41	AC-FT	94350	

MAX DISCH: 544 CFS AT 16:15 ON JUL 09,2011 GH 4.01 FT SHIFT 0.05 FT

MAX GH: 4.01 FT AT 16:15 ON JUL 09,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06696000 SOUTH PLATTE RIVER NEAR LAKE GEORGE
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
TARRYALL CREEK AT BORDEN DITCH
Water Year 2011

Location.--	Lat. N39°17'12.7", Long. W105°41'44.6" (NAD83) Park County CO, Hydrologic unit 10190001. Gage is located on the left bank approximately 1800 ft. downstream from Rock Creek, 9 mi. southeast of Jefferson, CO and 1 mi. northwest of Bordenville, CO.
Drainage Area and Period of Record.--	230 mi ² . April 26, 1983 to September 30, 1997; gage operated and record published by the USGS. Gage operation was taken over by the Colorado Division of Water Resources (DWR) beginning in the 1998 water year. Daily values available from the DWR from October 1, 2004 to present.
Equipment.--	Digital incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink2 Data Collection Platform (DCP) in a metal shelter overtop an 18-in. corrugated metal pipe stilling well. The well has a clean-out door on the stream side. The well is connected to the stream by one 2-in. intake. The primary reference is a metal drop tape with adjustable reference point with a supplementary outside staff gage. Station and satellite monitoring equipment are owned and maintained by the City of Aurora. DWR operates the gage under a contract with City of Aurora to provide real time data and record development.
Hydrologic Conditions.--	230 sq. mi. of high mountain alluvial plateau mostly devoid of forest. Conditions remain stable with continued light residential development upstream. Discharge affected by irrigation diversions and releases from Jefferson Lake and James Tingle reservoir.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP values as backup. Instrument calibration was maintained by twenty-three visits to the gage by City of Aurora and DWR personnel. The record is complete and reliable except for as follows: October 25 and 26, 2010 when the stage-discharge relation was affected by ice; July 19, 20 2011 and August 2, 3 and 10-15 2011 when reliable data was lost by tilting of the gage shelter to the point the float tape came disengaged from the shaft encoder; and October 27 and April 8, 2011, partial day records corresponding the shut down and startup of the station. Station is not maintained in winter months. No gage-height information is available from October 28, 2010 through April 7, 2011.
Datum Corrections.--	Levels were last run on October 13, 2011 using RM1 as base. The RP was found within allowable tolerances. No levels were run prior to or immediately following leveling of the gage shelter (August 24, 2011).
Rating.--	The control for low to medium flows is a rock riffle composed of boulders, gravel and sand approximately 100-ft. downstream of the gage. The stream reverts to channel control at higher stages up to an approximate gage-height of 6.00 ft where the channel is subject to overflow. Rating TARBORCO06, defined by measurements from 1.11 to 247 cfs, was continued in use for all of WY2011. Eleven discharge measurements (Nos. 90-100) were made during the year, ranging in discharge from 25.9 to 247 cfs covering the range in stage experienced this year except for higher daily flows occurring on June 20, 21, July 1, 2 and 8, 2011. The peak flow of 345 cfs occurred at 2330 on July 7, 2011 at a gage-height of 4.29 ft. with a shift of +0.03 ft. exceeding the high flow measurement (No. 95) made June 21, 2011 by 98 cfs and 0.47 ft. of stage respectively.
Discharge.--	Shifting control method was used all year. Shifts were distributed by time as defined by measurements from October 1 through October 27, 2010 and June 8 through July 7, 2011. From April 8 through June 8, 2011 variable shift table TARBORCOVST11_1 was applied. It is defined by four measurements (Nos. 91-94) made during the period of use. TARBORCOVST11_2, applied from July 7, 2011 to October 25, 2011 is defined by seven measurements (Nos. 96-102) made during the period of use. Open water measurements showed shifts varying between -0.01 and +0.08 ft. All were given full weight except for No. 91 which was adjusted 3.5% to smooth shift distributions.
Special Computations.--	Discharge for days of unreliable gage-height were estimated from adjacent good record and record developed at the downstream gage Tarryall Creek Below Tarryall Reservoir (TARTARCO).
Remarks.--	The record is good except for the ice affected days, days of partial record and days of estimation due to unreliable gage-height data which are estimated and poor. Station maintained and record developed by Mike Wild.
Recommendations.--	Levels should be run annually to monitor stability of the reference marks with respect to the shelter. Determine if a Sutron SDR shaft encoder is appropriate for this site and discuss capital costs with gage cooperator. Assess what, if anything should be done with the intake on the gage and if shelter should be replaced.

STATE OF COLORADO
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TARRYALL CREEK AT BORDEN DITCH

RATING TABLE-- TARBORCO06 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

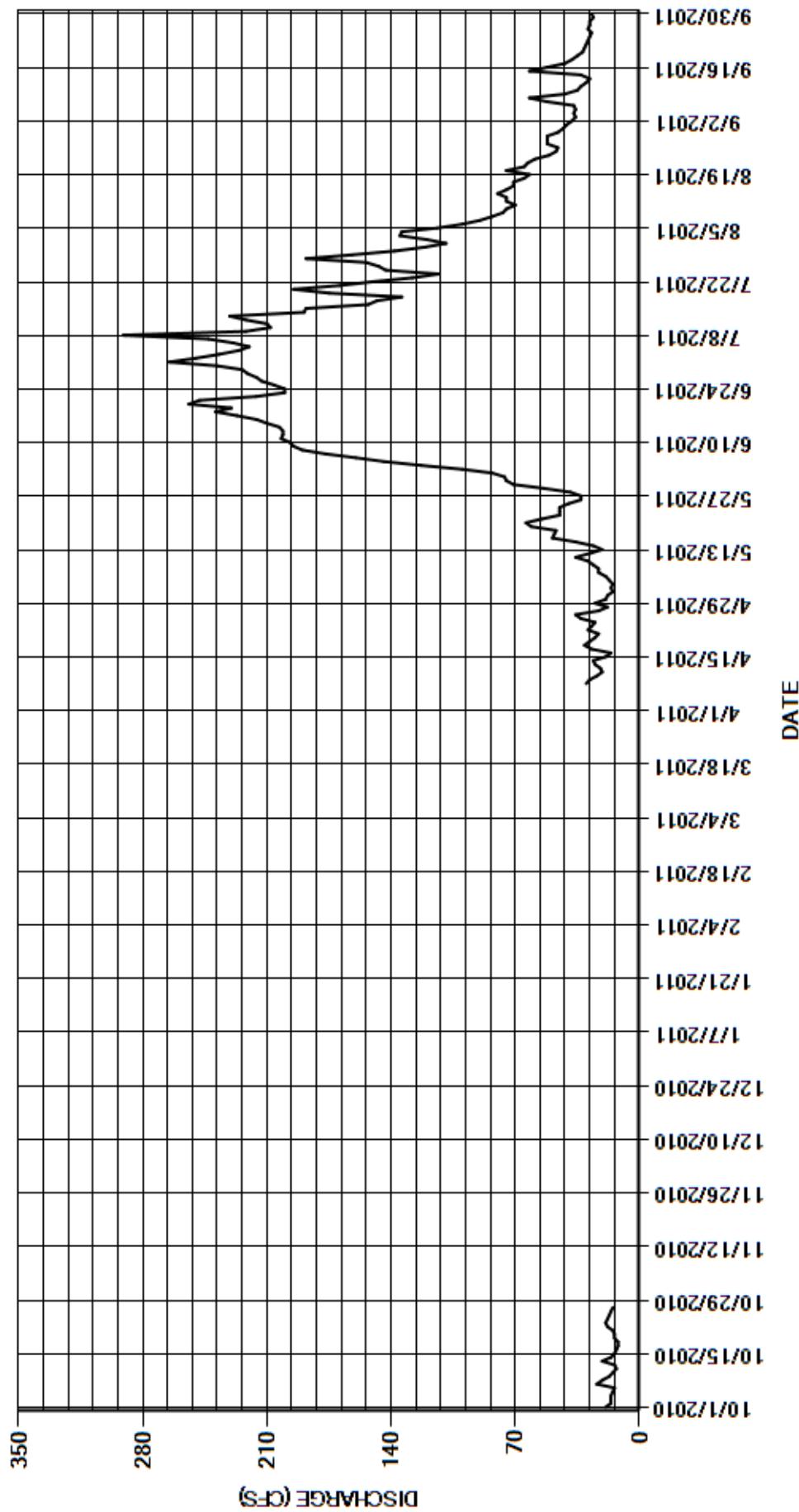
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	19	---	---	---	---	---	---	18	76	265	109	41
2	16	---	---	---	---	---	---	15	83	250	e120	38
3	16	---	---	---	---	---	---	16	100	237	e135	36
4	16	---	---	---	---	---	---	15	123	226	134	37
5	15	---	---	---	---	---	---	17	144	220	114	36
6	14	---	---	---	---	---	---	19	160	229	100	37
7	24	---	---	---	---	---	---	23	177	243	90	52
8	21	---	---	---	---	---	e30	23	190	291	83	62
9	17	---	---	---	---	---	28	26	195	222	77	42
10	15	---	---	---	---	---	24	29	197	208	e75	35
11	13	---	---	---	---	---	21	36	202	210	e70	33
12	14	---	---	---	---	---	22	28	201	222	e75	30
13	21	---	---	---	---	---	25	21	201	231	e75	28
14	16	---	---	---	---	---	26	26	203	189	e80	33
15	14	---	---	---	---	---	19	36	210	188	e75	62
16	13	---	---	---	---	---	16	49	216	153	71	52
17	12	---	---	---	---	---	27	48	227	148	71	42
18	12	---	---	---	---	---	31	47	239	134	65	38
19	14	---	---	---	---	---	28	61	230	e175	62	35
20	14	---	---	---	---	---	25	64	254	e195	75	32
21	15	---	---	---	---	---	23	55	248	169	65	31
22	18	---	---	---	---	---	29	45	216	150	63	30
23	19	---	---	---	---	---	27	45	200	128	59	29
24	18	---	---	---	---	---	25	45	200	113	51	28
25	e17	---	---	---	---	---	33	40	206	143	47	27
26	e16	---	---	---	---	---	36	33	213	147	46	29
27	e15	---	---	---	---	---	23	33	216	154	52	28
28	---	---	---	---	---	---	18	39	221	188	52	28
29	---	---	---	---	---	---	25	54	224	162	52	26
30	---	---	---	---	---	---	19	71	238	138	46	27
31	---	---	---	---	---	---	---	75	---	121	43	---
TOTAL	434	---	---	---	---	---	580	1152	5810	5849	2332	1084
MEAN	16.1	---	---	---	---	---	25.2	37.2	194	189	75.2	36.1
AC-FT	861	---	---	---	---	---	1150	2280	11520	11600	4630	2150
MAX	24	---	---	---	---	---	36	75	254	291	135	62
MIN	12	---	---	---	---	---	16	15	76	113	43	26
CAL YR	2010	TOTAL	11190	MEAN	58.9	MAX	276	MIN	12	AC-FT	22200	(PARTIAL YEAR RECORD)
WTR YR	2011	TOTAL	17241	MEAN	84.9	MAX	291	MIN	12	AC-FT	34200	(PARTIAL YEAR RECORD)

MAX DISCH: 345 CFS AT 23:30 ON JUL 07,2011 GH 4.29 FT SHIFT 0.03 FT

MAX GH: 4.29 FT AT 23:30 ON JUL 07,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

TARRYALL CREEK AT BORDEN DITCH
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
TARRYALL CREEK BELOW TARRYALL RESERVOIR
Water Year 2011

Location.--	Lat. N39°13'18.1", Long. W105°36'09.1" (NAD83) Park County, CO. Gage is on the right downstream bridge abutment of the Park County Road 77 bridge approximately 1000 ft. downstream from the Tarryall Reservoir dam and 15 miles southeast of Jefferson, CO.
Drainage Area and Period of Record.--	355 sq. mi., from DWR Dam Safety Section database. The age of the gage is not known; although the reservoir was built in 1929. The type and kind of materials used is consistent with gaging stations constructed in the 1970's. The gage has been operated infrequently; records were kept from 1975-1980 and resumed in 2005. The Colorado Division of Water Resources (DWR) made the first known discharge measurement in August 1974. The gage was actived with satellite monitoring in the 2005 Water Year. Daily values are available from June 20, 1975 through September 30, 1980 and March 5, 2005 to present.
Equipment.--	Digital incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink 2 Data Collection Platform (DCP) in a 36-inch CMP structure located on the right downstream abutment of a bridge on Park County Road 77. The primary reference is an adjustable reference point and a metal drop tape with a staff gage placed on the center bridge pier as a supplemental reference. Gage is operated and equipment is maintained by the Colorado Division of Water Resources under a cooperative agreement with the Colorado Division of Wildlife, the owner of Tarryall Reservoir.
Hydrologic Conditions.--	High mountain alluvial plateau mostly devoid of forest. Conditions remain stable with continued light residential development upstream. Discharge affected by irrigation diversions, releases from Jefferson Lake and James Tingle reservoir. Natural flow of stream affected by storage in Tarryall Reservoir and diversions for irrigation and return flow from irrigated areas.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data as backup. Instrument calibration was supported by twenty-seven visits to the gage by DWR personnel. No instrument corrections were noted this year. The record is complete and reliable except for: November 21-23, 2010, stage-discharge relation affected by ice; November 24-26, 2010 inlets / stilling well frozen; March 24 and September 30, 2011 partial day records and April 15 and 16, 2011 construction activities for a new bridge upstream of gage created disruption in the reliability of the gage-height record. Some degree of backwater due to downstream beaver dams was experienced from May 31 through September 2, 7-10 and 15-19, 2011. The gage is not operated in winter months. The period of record for this water year is October 1 through November 26, 2010 and March 24 through September 30, 2011. No gage-height information is available from November 27, 2010 through March 23, 2011. The gage was taken offline in preparation to remove the gaging facilities for construction of the new bridge on September 30, 2011. A new gage was subsequently installed on October 20, 2011 and completed on November 17, 2011.
Datum Corrections.--	Levels were last run on August 27, 2008 using R.M. 1 as base. The RP was found to be 0.014 ft. low. No corrections were made.
Rating.--	The control was a rock riffle below the gage. TARTARCO03, dated July 29, 2010 was continued in use for all of WY2011. Fourteen discharge measurements (Nos. 142-155) were made this year ranging in discharge from 7.77 to 264 cfs covering the range in stage experienced this year well except for the higher daily flows of July 8 and 9, 2011. The peak flow of 297 cfs occurred at 2045 July 8, 2011 at a gage-height of 4.32 ft. with a shift of -0.14 ft. It exceeded the high flow Measurement No. 150 by 33 cfs and 0.15 ft. of stage.
Discharge.--	Shifting control methods was used all year. Shifts are caused by fill and scour in the gage pool, vegetal growth in the channel and beaver activity downstream of the gage. Shifts were prorated by time as defined by measurements from October 1 through November 20, 2010 and June 21 through August 3, 2011. Variable shift table TARTARCOVST11_1, defined by six measurements (Nos. 145-150) made during the period of use was applied to the record from March 24 through June 21, 2011. Variable shift table TARTARCOVST11_2 defined by measurement Nos. 152-155 was applied to the record from August 3, 2011 through September 30, 2011. Open water measurements showed raw shifts varying between -0.21 and +0.05 ft. All were given full weight except for Nos. 142, 145 and 146 which were adjusted 3.97, -4.86 and 3.10% respectively to smooth shift distributions.
Special Computations.--	Discharge for the ice affected periods was estimated from adjacent good record with consideration given to temperature trends and discharge measurements made during the period of ice affect. Discharge for partial day records was estimated from adjacent good record. Similarly, discharges for periods of construction activity in the channel were estimated from adjacent good record. A mass balance spreadsheet was used to compare discharge to the upstream TARBORCO gage. Consideration must be given to irrigation diversions, evaporative losses and transit delay though Tarryall reservoir.
Remarks.--	The record is good with exception of: periods of ice affect and frozen inlets which are estimated and poor; partial day records which are estimated and poor; days affected by construction activities in the channel which are fair and periods of backwatered caused by beaver activites downstream of the gage which are fair. The peak flow for the year is also rated fair. This is a partial year record. The period of record for the 2011 Water Year is October 1 through November 26, 2010 and March 24 through September 30, 2011. The stream gage was relocated following completion of the new bridge by the Federal Highway Commission in cooperation with the DWR October, 2011. Station maintained and record developed by Mike Wild.
Recommendations.--	Installation of a outside wire weight gage on the new bridge.

STATE OF COLORADO
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TARRYALL CREEK BELOW TARRYALL RESERVOIR

RATING TABLE-- TARTARCO03 USED FROM 01-OCT-2010 TO 30-SEP-2011

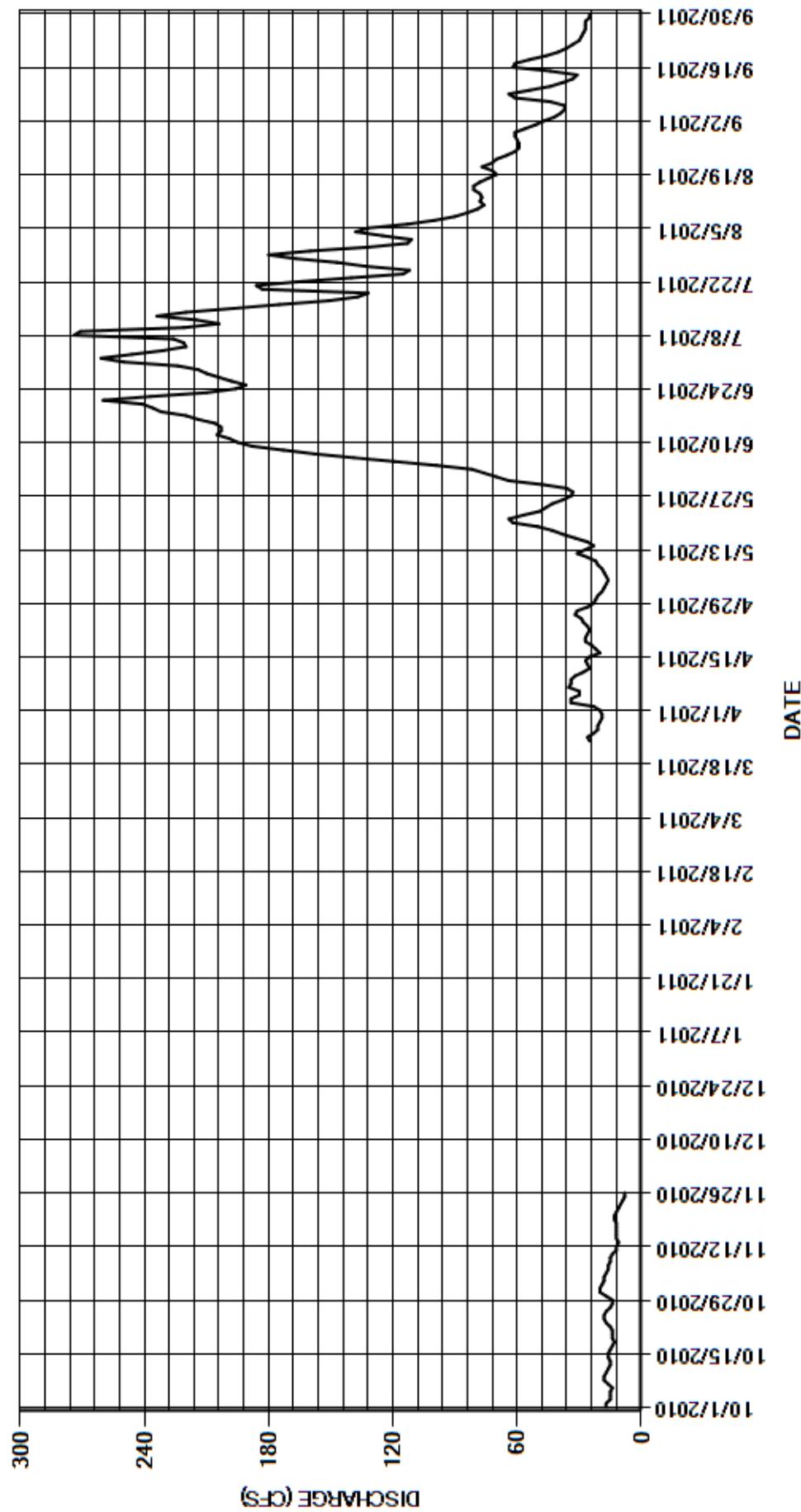
DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011												
DAY	MEAN VALUES											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	20	---	---	---	---	20	21	e70	e250	e113	e51
2	17	19	---	---	---	---	23	19	e76	e261	e111	e47
3	15	18	---	---	---	---	34	18	e82	e246	e125	42
4	15	18	---	---	---	---	34	17	e99	e231	e138	39
5	15	17	---	---	---	---	30	16	e119	e220	e132	37
6	14	16	---	---	---	---	30	17	e139	e221	e113	37
7	16	16	---	---	---	---	35	18	e158	e226	e100	e44
8	18	15	---	---	---	---	34	19	e173	e274	e90	e61
9	18	15	---	---	---	---	34	21	e188	e271	e84	e64
10	17	14	---	---	---	---	32	22	e195	e221	e79	e54
11	16	12	---	---	---	---	28	26	e199	e204	e76	44
12	15	12	---	---	---	---	25	31	e205	e215	e78	38
13	15	11	---	---	---	---	26	27	e203	e234	e77	33
14	16	12	---	---	---	---	27	23	e203	e220	e78	31
15	16	12	---	---	---	---	e25	26	e206	e197	e81	e44
16	15	12	---	---	---	---	e20	32	e214	e175	e81	e62
17	14	12	---	---	---	---	22	38	e220	e151	e78	e61
18	13	12	---	---	---	---	24	43	e232	e137	e74	e54
19	14	13	---	---	---	---	27	50	e236	e132	e70	e46
20	14	13	---	---	---	---	27	62	e241	e183	e72	40
21	14	e12	---	---	---	---	26	64	e260	e186	e77	36
22	15	e11	---	---	---	---	25	57	e237	e165	e72	33
23	17	e10	---	---	---	---	26	49	e210	e140	e70	30
24	18	e9.0	---	---	---	e25	28	46	e196	e115	e65	29
25	18	e8.0	---	---	---	26	29	43	e191	e112	e61	28
26	17	e8.0	---	---	---	23	32	38	e198	e133	e59	27
27	15	---	---	---	---	21	31	34	e204	e147	e59	27
28	14	---	---	---	---	21	26	33	e210	e167	e60	27
29	14	---	---	---	---	20	23	36	e214	e180	e61	25
30	17	---	---	---	---	19	22	48	e224	e160	e61	e25
31	20	---	---	---	---	19	---	e64	---	e132	e56	---
TOTAL	489	347.0	---	---	---	174	825	1058	5602	5906	2551	1216
MEAN	15.8	13.3	---	---	---	21.8	27.5	34.1	187	191	82.3	40.5
AC-FT	970	688	---	---	---	345	1640	2100	11110	11710	5060	2410
MAX	20	20	---	---	---	26	35	64	260	274	138	64
MIN	13	8.0	---	---	---	19	20	16	70	112	56	25
CAL YR	2010	TOTAL	11700.0	MEAN	51.5	MAX	267	MIN	8.0	AC-FT	23210 (PARTIAL YEAR RECORD)	
WTR YR	2011	TOTAL	18168.0	MEAN	73.3	MAX	274	MIN	8.0	AC-FT	36040 (PARTIAL YEAR RECORD)	

MAX DISCH: 297 CFS AT 20:45 ON JUL 08,2011 GH 4.32 FT SHIFT -0.14 FT

MAX GH: 4.32 FT AT 20:45 ON JUL 08,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

TARRYALL CREEK BELOW TARRYALL RESERVOIR
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06701500 SOUTH PLATTE RIVER BELOW CHEESMAN RESERVOIR
Water Year 2011

Location.--	Lat. N39°12'33.58"; Long. W105°16'4.83" (NAD83) Jefferson County, Hydrologic Unit 10190002. Gage is located on the left side of a 30-ft. Parshall Flume, approximately 1,400-ft. downstream from the toe of Cheesman Dam and 3.8 miles SW of Deckers, CO.
Drainage Area and Period of Record.--	1760 sq. mi. (USGS Colorado StreamStats utility). Daily Values available from October 1, 1924 to present. From October 1, 1924-May 13, 1956 at site 370 feet upstream and 0.50 ft. higher. From May 14, 1956 to present, current site. Unreliable record from 1909 to 1924 unpublished.
Equipment.--	Digital incremental Sutron SDR-0001-4 shaft encoder connected to a Sutron SatLink2 Data Collection Platform (DCP) transmitting hourly in a rectangular concrete shelter and concrete stilling well at a 30-ft. Parshall Flume. An electric tape gage in the shelter is the primary reference with no provisions for a supplemental staff gage. The stilling well is connected to the flume via one 2-in. intake without flushing equipment. Gage is owned and maintained by Denver Water and operated cooperatively with the Colorado Division of Water Resources.
Hydrologic Conditions.--	Regulated and unregulated flow. Cheesman Reservoir, an on-channel reservoir, regulates all flows at the gage unless the reservoir is spilling. Cheesman Reservoir is in the center of the 2002 Hayman burn area. The fire severely damaged the watershed. Denver Water Board has performed extensive erosion control in the area surrounding the reservoir. Major revegetation efforts were performed in the burn area to reduce erosion and water quality problems.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data and 5-minute logged SDR data as backup. Instrument calibration was maintained by 18 visits made to the gage by DWR personnel. Three instrument corrections ranging from -0.01 to +0.02 ft. were made this year; all were distributed by time as defined by visits or event. The record is complete and reliable except for: December 2, 2010 when seven hours of data was missing or erroneous resulting from work being conducted by contractors in the gage. Missing or erroneous values were interpolated from adjacent good record assuming a constant release rate. Missing unit values not exceeding four unit values per day stemming from work being done in the gage or to the telemetry equipment itself occurring on October 12, December 1, 2010, February 22, March 15, August 16 and 31, 2011 were interpolated from adjacent good record without loss of accuracy. Up to three unit values per day occurring on January 1, April 27, June 2 and 16, 2011, during flume cleaning activities were deemed erroneous and manually adjusted from adjacent good record without loss of accuracy. Due to the flume's proximity to the dam, ice accumulation in the approach, flume and departing section is normally not an issue. Vegetal growth in the flume can affect the flume's performance. The flume was cleaned four times; November 18, 2010, February 22, June 2 and 16, 2011 returning cleaning corrections of no change to -0.04 ft.
Datum Corrections.--	Levels were run after the installation of the new gage house on July 20, 2010 using R.M. 2 as base. The ETG was reset on the new instrument shelf and a new metal tape was indexed at 13.604 ft.
Rating.--	The control for all stages is a 30-ft. Parshall Flume. PLACHECO11, developed in 1995 in an attempt to compensate for submergence of the flume at high stages, was continued in use for all of WY2011. The rating is well defined except for the upper ranges (~1000 cfs) where submergence appears to cause a break in slope of the curve. Shifts have been typically positive unless extensive vegetal growth is present. A new rating showing a more even distribution of shifts throughout the range of expected flow has been developed and is currently be evaluated. Twenty measurements (Nos. 245-264) were made this year, ranging in discharge from 78.7 to 759 cfs. Measurements made this year cover the range in stage experienced this year well except for higher daily flows from July 8 through July 18, 2011 and lower daily flows from October 2 to October 10, and November 10, 11, 2010. The peak flow of 817 cfs occurred at 1545 on July 11, 2011 at a gage height of 3.37 feet with a shift of +0.12 ft. exceeding the high flow measurement (No. 260) made July 7, 2011 by 58 cfs and 0.16 ft. of stage respectively.
Discharge.--	Shifting control method was use all year. Shifts are caused by scour and fill of channel materials upstream of the flume in the approach section as well as vegetal growth within the flume. Shifts were distributed by time with consideration given to change in stage. Variable shift table PLACHECOVST11_1, defined by nine measurements (Nos. 245-251 and Nos. 256 and 260) was applied from October 11, 2010 through March 30, 2011. Variable shift table PLACHECOVST11_2, defined by five measurements (Nos. 251-253 and Nos. 256 and 260) was applied from March 30 to May 24, 2011. Variable shift table PLACHECOVST11_3, defined by four measurements (Nos. 258-260 and No. 256) was applied from June 16 through July 18, 2011. Variable shift table PLACHECO11_4, defined by five measurements (Nos. 262-265 and Nos. 256 and 260) was applied from August 16 to October 5, 2011. All other shifts were applied by time as defined by measurements with consideration given to change in stage. Open water measurements showed shifts varying between -0.04 and +0.12 ft. All were given full weight except for Nos. 255, 264 and 265, occurring in the 2012 Water Year, were adjusted up to 3% to smooth shift distributions.
Special Computations.--	Flume cleaning corrections are handled differently depending on whether it is the State or Denver Water perform the cleaning. If the gage height drops as a result of a Denver Water flume cleaning, it usually occurs between measurements, it is Denver Water's procedure to increase the release so that the same gage height is maintained. A datum correction is applied to account for the moss accumulation. Generally if the flume is cleaned by a State Hydrographer, a measurement is made before and after the flume cleaning with shifts applied accordingly.
Remarks.--	The record is considered good, except for December 2, 2011 which is estimated and fair. Station maintained by Mike Wild record developed by Mike Wild and Division One staff.

Recommendations.--

Continue to evaluate the efficacy of the new rating with WY2012 measurements. Levels must be run in the 2012 Water Year to check stability of the primary reference.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06701500 SOUTH PLATTE RIVER BELOW CHEESMAN RESERVOIR

RATING TABLE-- PLACHECO11 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

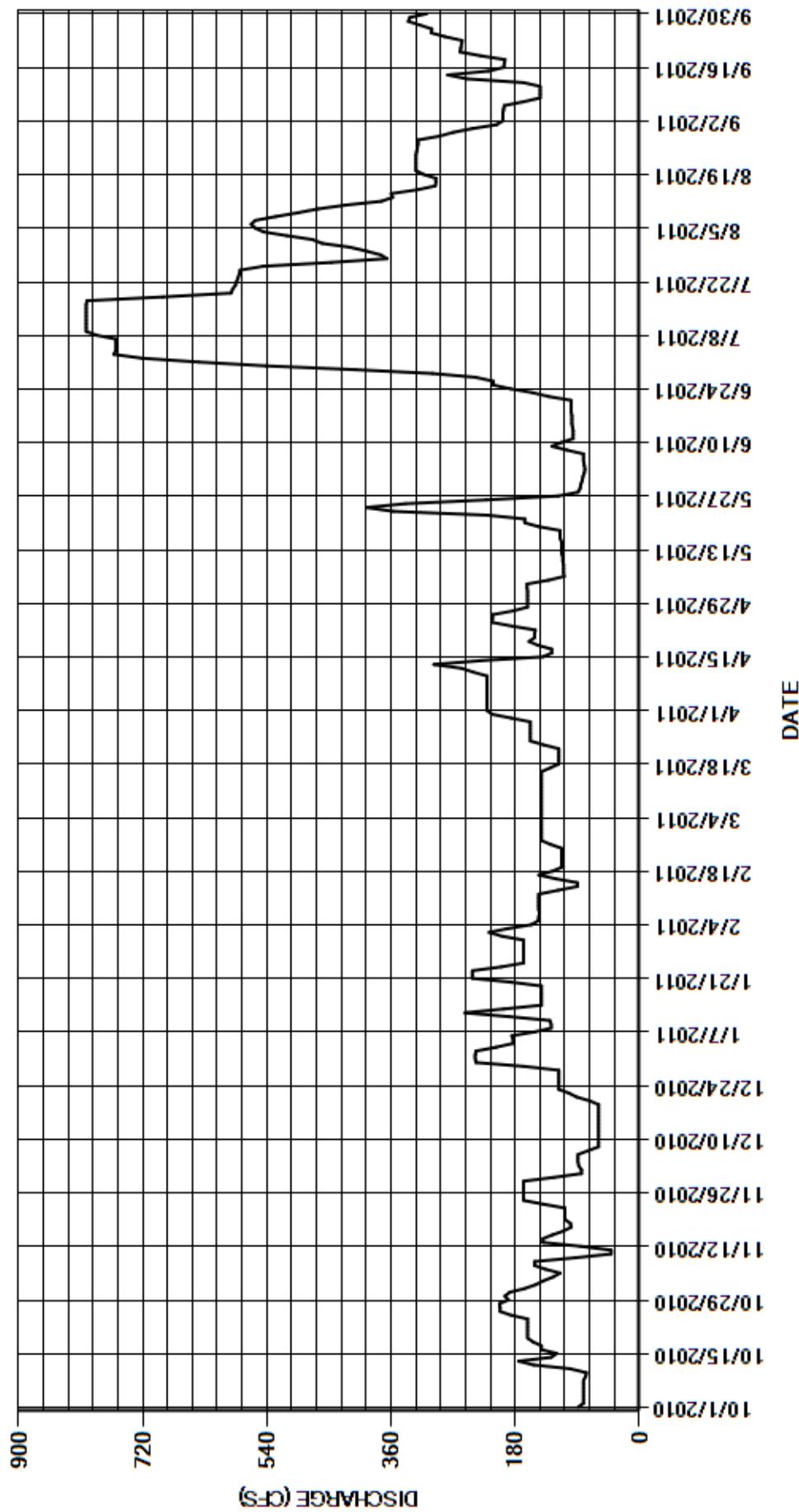
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	89	166	84	238	199	142	221	162	82	639	460	207
2	81	150	84	237	218	142	221	162	80	721	474	198
3	81	139	88	208	191	142	221	163	79	762	511	198
4	81	125	89	183	157	142	221	163	80	759	545	198
5	81	115	89	183	147	142	221	132	81	759	557	197
6	81	136	89	185	146	142	221	109	81	759	563	196
7	81	152	74	152	145	142	221	110	81	759	557	168
8	81	152	59	128	146	142	221	110	105	787	527	144
9	78	93	59	128	146	142	221	110	127	802	495	144
10	77	41	59	130	146	142	221	111	113	802	466	144
11	100	41	59	189	146	142	241	111	96	802	426	144
12	153	85	59	253	146	142	258	113	96	802	374	168
13	175	140	59	197	118	142	298	113	96	802	358	251
14	128	140	59	142	90	142	230	113	97	802	360	278
15	120	126	59	142	90	142	140	113	98	802	322	219
16	142	110	59	142	121	142	127	115	98	802	296	196
17	142	99	59	142	146	129	127	115	98	801	295	196
18	154	100	59	142	126	117	147	115	99	691	295	195
19	162	108	59	142	113	117	160	146	99	592	313	230
20	162	108	72	186	113	117	152	166	99	590	324	260
21	162	108	91	242	113	117	152	166	99	586	324	259
22	162	108	102	242	113	117	151	221	132	584	324	258
23	162	139	117	242	113	139	184	357	155	582	324	257
24	162	168	117	200	113	158	214	396	187	580	324	282
25	186	168	117	168	129	158	213	339	212	579	323	302
26	202	168	117	168	142	158	213	222	212	546	322	301
27	202	168	117	168	142	158	183	118	237	447	321	318
28	203	168	117	168	142	158	162	89	300	366	321	335
29	190	168	167	168	---	158	162	86	412	375	290	333
30	195	124	237	168	---	186	162	85	542	396	270	308
31	188	---	238	168	---	214	---	83	---	420	242	---
TOTAL	4263	3813	2914	5551	3857	4473	5886	4714	4373	20496	11903	6884
MEAN	138	127	94.0	179	138	144	196	152	146	661	384	229
AC-FT	8460	7560	5780	11010	7650	8870	11670	9350	8670	40650	23610	13650
MAX	203	168	238	253	218	214	298	396	542	802	563	335
MIN	77	41	59	128	90	117	127	83	79	366	242	144
CAL YR	2010	TOTAL	72473	MEAN	199	MAX	773	MIN	41	AC-FT	143800	
WTR YR	2011	TOTAL	79127	MEAN	217	MAX	802	MIN	41	AC-FT	156900	

MAX DISCH: 817 CFS AT 15:45 ON JUL 11,2011 GH 3.37 FT SHIFT 0.12 FT

MAX GH: 3.37 FT AT 15:45 ON JUL 11,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06701500 SOUTHPLATTE RIVER BELOW CHEESEMAN RESERVOIR
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
NORTH FORK SOUTH PLATTE RIVER AT GRANT
Water Year 2011

Location.--	Lat. 39°27'26", Long. 105°39'29" in NW 1/4 sec. 10, T.7 S., R.74 W., Park County, Hydrologic Unit 10190002, on left bank at Grant, 1,350 ft downstream from Geneva Creek, and 1.0 mi downstream from east portal of Harold D. Roberts tunnel.
Drainage Area and Period of Record.--	127 mi ² ; 1948 to present.
Equipment.--	Digital incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink 2 Data Collection Platform (DCP) and a graphic Stevens A type water stage recorder in a wooden shelter overtop a 36-inch concrete stilling well next to a concrete trapezoidal channel section and spillway. A metal drop tape and adjustable reference point serve as the base reference. There are no provisions for a supplemental reference. The gage is equipped with A/C power, heat lamps and heat tape to prevent freezing of the stilling well and intakes in winter months. The gage is owned and maintained by Denver Water in cooperation with the Colorado Division of Water Resources.
Hydrologic Conditions.--	Semi-controlled release. Gage is affected by natural stream flows from Kenosha Creek, Geneva Creek and discharges from the East Portal of the Roberts tunnel. Rapid changes in stage are caused by the regulation of Roberts Tunnel, 1 mile upstream. When Roberts Tunnel is operating in winter months, the gage is usually free of ice. Insufficient stilling due to rock and cobble build up at gage pool produces choppy water surfaces and fast velocities in the gage pool.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data and chart record as backup. Instrument calibration was supported by twenty-six visits made to the gage. One instrumentation correction of -0.01 ft. was made on September 30, 2011 which was applied to the record as defined by visits. The record is complete and reliable except for: February 1, March 2, 4-6, 8-10, 23-27 and 29-30; April 4, 5 and 11, 2011 when the stage-discharge relation was affected by ice.
Datum Corrections.--	Levels were last run on August 27, 2008 using R.M.4 as base. The elevation of the base reference gage was found to be within allowable tolerances.
Rating.--	The control for stages below 4.00 ft. is a broad crested weir with slightly raised edges. The overflow control has good getaway conditions and should not become submerged. Both banks are clear up to a stage of approximately 5.00 ft. Shifts are caused by scour and fill of the weir pool and by gradual erosion of the control. Rating No. 12 (PLAGRACO12), in use since October 1, 2001 was used for the entire period of record. It is defined by measurements from 15.6 to about 700 cfs. Fifteen discharge measurements (Nos. 1093-1107) were made during the year, ranging in discharge from 17.0 to 419 cfs covering the range in discharge experienced well except for higher daily flows of June 8-21 and June 30-July 7, 2011. The peak flow of 631 cfs occurred at 2230 on June 11, 2011 at a gage-height of 1.85 ft. with a shift of +0.01 ft. exceeding high flow Measurement No. 1103 by 213 cfs and 0.28 ft. of stage.
Discharge.--	Shifting control method was use of all periods of open water. Shifts were distributed by time with consideration given to change in stage. Stage dependent shifting was used from October 1, 2010 to December 29, 2010 using variable shift table PLAGRACOVST10-2; defined by nine measurements made during the period of use in the 2010 and 2011 water years. From 0815 on June 20, 2011 through the end of the water year stage dependent shifting using variable shift table PLAGRACOVST11-A was applied. PLAGRACOVST11-A is defined by six discharge measurements (Nos. 1103-1108) made during the period of use. Open water measurements show unadjusted shifts varying between -0.04 and +0.05 ft. All were give full weight except for Nos. 1093, 1095, 1101, 1105 and 1107 which were discounted from 2.8% to -4% to smooth shift distributions.
Special Computations.--	Discharge for the ice affected periods was estimated from adjacent good record. A spreadsheet is used to compute the daily difference between the Grant gage and Roberts Tunnel. This difference represents the native flow in the North Fork without the Roberts Tunnel. Since this flow should follow trends and should never be negative, the calculation is a reality check on the computation of both records.
Remarks.--	The record is good with exception of the ice affected periods, which are estimated and poor. Station maintained by Tony Arnett, record developed by Tony Arnett and Division 1 staff.
Recommendations.--	The Roberts Tunnel and North Fork of the South Platte at Grant record should be worked on a monthly basis. A wire weight gage should be installed at this gage as there is a need for an outside reference to verify the primary reference. Levels must be run in the 2012 Water Year.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

NORTH FORK SOUTH PLATTE RIVER AT GRANT

RATING TABLE-- PLAGRACO12 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

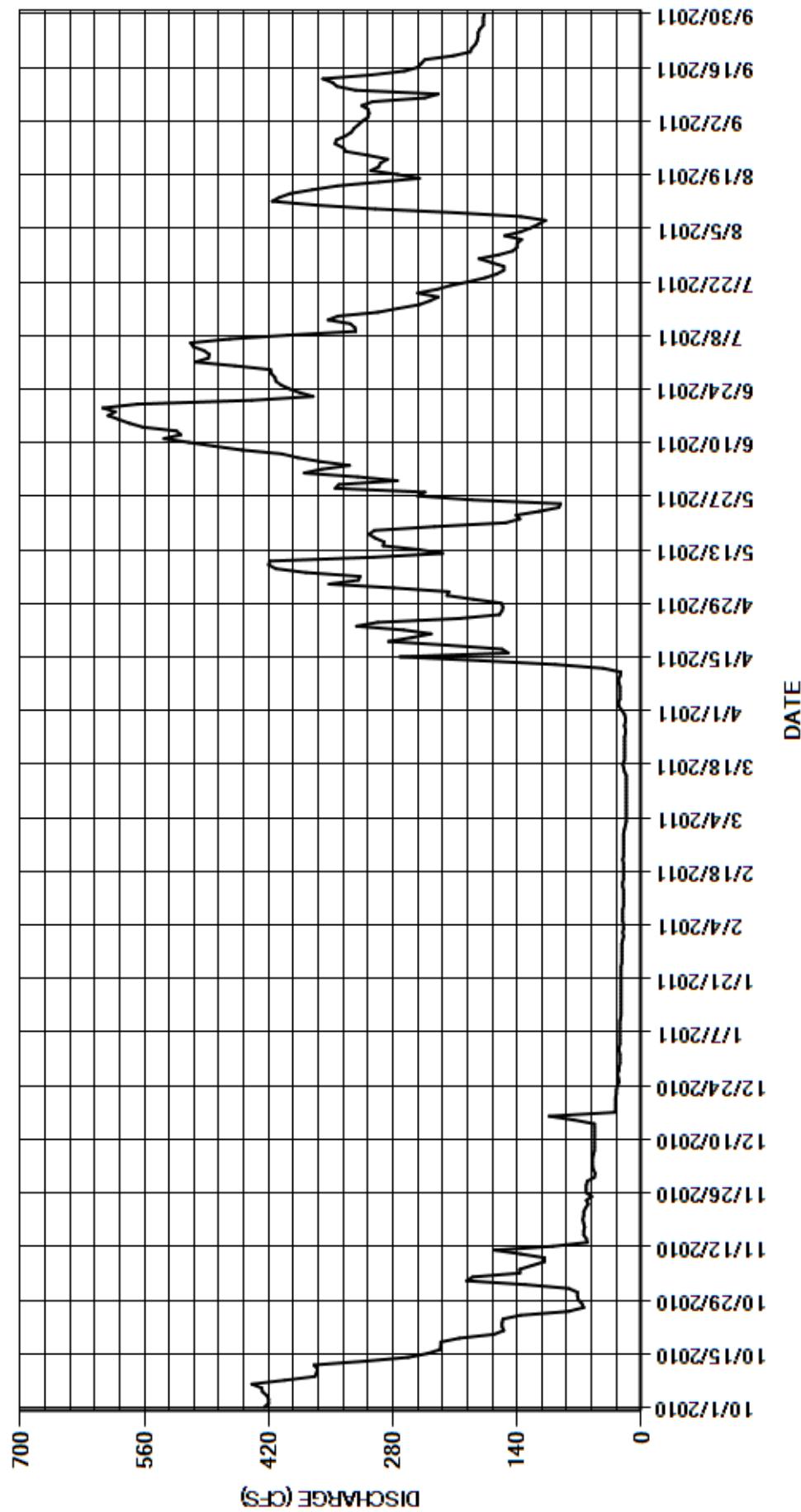
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	425	82	52	24	e20	19	22	219	320	503	140	319
2	420	131	54	25	21	e18	25	217	380	488	135	314
3	420	197	55	25	20	17	26	279	360	487	154	308
4	422	190	55	24	20	e17	e24	352	329	493	136	307
5	427	137	55	24	21	e17	e24	319	362	505	125	308
6	428	137	54	24	21	e17	24	317	387	508	116	315
7	439	123	53	24	21	17	24	378	405	464	108	303
8	402	109	53	24	21	e17	25	412	450	399	136	244
9	368	109	53	24	20	e17	26	420	481	322	209	229
10	366	136	53	24	20	e17	24	419	510	323	300	322
11	365	165	53	23	20	17	e23	302	538	328	367	343
12	369	100	53	23	20	17	43	224	519	353	416	348
13	311	61	53	23	20	17	97	251	524	342	408	359
14	263	62	53	23	21	17	181	291	562	297	396	304
15	241	65	76	23	21	17	272	290	577	274	371	267
16	227	65	104	23	20	19	150	300	589	250	343	252
17	226	64	30	23	20	20	157	307	601	238	296	248
18	226	65	29	23	20	21	218	301	593	229	250	244
19	205	66	29	23	20	19	285	233	607	252	275	212
20	166	65	29	23	20	19	259	153	568	230	305	193
21	155	65	29	23	21	19	237	137	439	215	296	191
22	157	63	28	23	20	19	268	141	370	194	294	187
23	157	60	28	23	20	e19	321	115	385	176	286	185
24	156	62	27	23	20	e19	297	93	397	163	308	184
25	136	56	25	22	20	e19	206	91	406	155	333	184
26	82	62	26	22	20	e18	160	191	412	155	336	182
27	65	62	27	22	20	e18	157	252	413	169	345	178
28	67	62	25	22	20	19	156	244	417	183	344	178
29	71	61	25	22	---	e18	158	345	418	161	334	178
30	72	53	24	22	---	e18	189	341	458	145	327	177
31	72	---	24	21	---	19	---	275	---	140	324	---
TOTAL	7906	2735	1334	717	568	561	4078	8209	13777	9141	8513	7563
MEAN	255	91.2	43.0	23.1	20.3	18.1	136	265	459	295	275	252
AC-FT	15680	5420	2650	1420	1130	1110	8090	16280	27330	18130	16890	15000
MAX	439	197	104	25	21	21	321	420	607	508	416	359
MIN	65	53	24	21	20	17	22	91	320	140	108	177
CAL YR	2010	TOTAL	51065	MEAN	140	MAX	579	MIN	12	AC-FT	101300	
WTR YR	2011	TOTAL	65102	MEAN	178	MAX	607	MIN	17	AC-FT	129100	

MAX DISCH: 631 CFS AT 22:30 ON JUN 11,2011 GH 1.85 FT SHIFT 0.01 FT

MAX GH: 1.85 FT AT 22:30 ON JUN 11,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

NORTH FORK SOUTH PLATTE RIVER AT GRANT
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06707500 SOUTH PLATTE RIVER AT SOUTH PLATTE
Water Year 2011

Location.--	Lat. N. $39^{\circ} 24'31.85''$, Long. W $105^{\circ} 10'11.91''$ (NAD83), Jefferson County, CO Hydrologic Unit 10190002. Gage is located on the left bank of the South Platte River approximately 350 ft. downstream from the bridge on State Highway 75 and 500 ft. downstream from the confluence of the South and North forks of the South Platte River.
Drainage Area and Period of Record.--	2,580 mi 2 (USGS Colorado StreamStats utility). Daily values are available from the CDWR from: Jan 1, 1896 June 30, 1897; January 1, 1899 to May 31, 1900; June 1, 1901 to present.
Equipment.--	Digital incremental Sutron shaft encoder, tipping bucket rain gage and temperature sensor connected to a Sutron SatLink 2 Data Collection Platform (DCP) and a stand-alone Sutron SDR-0001-1 data logger in a concrete shelter overtop a 60-inch CMP well on the left bank. The primary gage is an electric tape gage (ETG) mounted on the equipment shelf. A cableway exists just upstream of the shelter for measurement of flows that are too high to wade. The gage is on Denver Water Board property and has AC power. Satellite equipment is owned and maintained by Division of Water Resources.
Hydrologic Conditions.--	Stream is heavily regulated by upstream reservoirs, diversion from and deliveries to the stream. Drainage area is mountainous with flows being principally controlled by releases from Cheesman Reservoir on the South Fork and transmountain deliveries made to the North Fork via Roberts Tunnel. A large portion of the drainage area is in areas having significant burn areas from the Hayman, Schoonover and Buffalo Creek fires. Soil erosion from these fires is stabilizing and turbidity, though still present, is decreasing. Trees and other organic material migrate down river during heavy precipitation events.
Gage-Height Record.--	The primary record is 15-minute satellite data with logged 15-minute DCP data and logged 5-minute SDR data as backup. Checks between the shaft encoder and the SDR agreed within 0.02 ft. all year. The record is complete and reliable except for: December 31, 2010; January 1-3, 7, 8, 10, 12, 13, 19, 24, 31; February 1-15, 18-24, 27-28; March 1-6, 8, 12, 13, 15 and 17-22, 2011 when the stage-discharge relation was affected by ice. Instrument calibration was maintained by twenty-two visits made to the gage. One sensor adjustment of +0.01 ft. was made on May 24, 2011 and applied by time to the last visit.
Datum Corrections.--	Levels were last run on August 27, 2008. No corrections were necessary.
Rating.--	The low flow control is a slight narrowing of the channel and rock riffle. For moderate to high stages the control is the channel and stream banks. A channel constriction approximately 0.25 miles below the gage will affect extremely high flows. Rating PLASPLCO16 in use since October 1, 2002 was continued this year. It is defined by measurements to 3350 cfs. Eleven discharge measurements (Nos. 833-848) were made this year ranging in discharge from 166 to 1370 cfs and covered the range in stage experienced this year well except for the lower daily flow occurring on December 8, 11, 12, 18 - 20, 22, 2010 and February 14 and 15, 2011. The peak flow of 1530 cfs occurred at 2130 on July 13, 2011 at a gage-height of 4.75 ft. with a shift of -0.04 ft. It exceeded the high flow measurement No. 844, made on July 7, 2011 by 0.21 ft. of stage.
Discharge.--	Shifts are caused by the movement of gravel and sand through the measurement section. Winter ice conditions also result in shifts. Shifting control method was used all year. Shifts were applied as defined by measurements with some consideration given to change in stage from October 1, 2010 – April 27, 2011, June 20 -29 and September 19 – 30, 2011. Variable shift table PLASPLCOVST11-1 defined by measurement Nos. 839-842 was applied from April 27 through June 20, 2011. Variable shift table PLASPLCOVST11-2 defined by measurement Nos. 844-848 was applied from June 29 through September 19, 2011. Measurements made this year show unadjusted shifts varying between -0.04 ft. and +0.07 ft. All measurements were given full weight except for No. 845 which was adjusted 5.35% to better fit the shift distribution.
Special Computations.--	Ice effect is not always obvious from the GH record. Ice periods are identified by comparing computed record against DWD estimates for computed inflow to Strontia Springs Reservoir, about 2 miles downstream. The ice periods are also identified by correlation to sustained low temperatures. Generally the computed record will start to greatly exceed the DWD figures shortly after winter weather sets in, ice record is considered to begin. Most years the computed figures will remain high until sustained warm weather. When gage figures and DWD figures get close again, ice-affect is assumed to be over. The winter of 2010/2011 was warmer than usual which created shorter periods of ice affect. A spreadsheet is also developed for the ice period displaying computed record, Strontia estimates, weather data, tributary inflows from Cheesman Reservoir and the North Fork of the South Platte at Grant. Ice periods are apparent when computed discharges are higher than Strontia inflow and out of line with trends from tributary gages. Inflows into Strontia from DWB accounting were used to estimate discharge for December 31, 2010, January 1-3, 7, 8, 10, 12, 13, 19, 24, 31, 2011. February 1-15, 18-24, 27, 28 2011 and March 1-6, 8, 12 13 15 17-22, 2011.
Remarks.--	The record is good, except for periods of ice effect, which are estimated and poor. Station maintained and record developed by Mike Wild.
Recommendations.--	Winter measurements and visits should continue to be made if possible in order to better determine ice affected days. Measurements should also continue to be made twice a month as conditions allow. Levels should be run in WY2012.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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06707500 SOUTH PLATTE RIVER AT SOUTH PLATTE

RATING TABLE-- PLASPLCO16 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

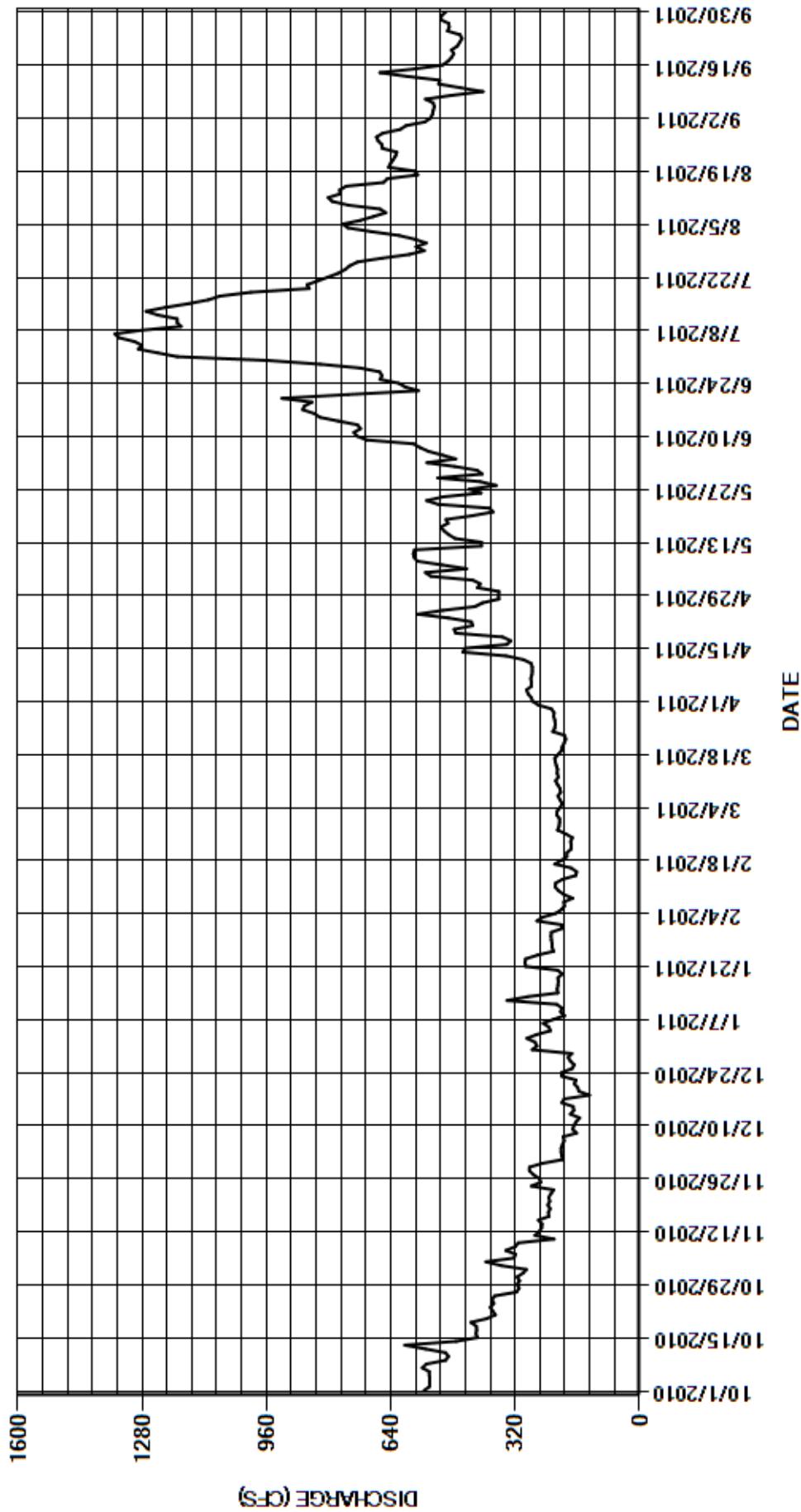
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	555	300	198	e269	e201	e206	275	417	418	1190	578	552
2	541	291	200	e290	e264	e213	279	410	475	1240	619	538
3	540	356	202	e265	e249	e212	287	429	547	1290	689	533
4	540	395	202	229	e216	e204	291	537	473	1280	750	531
5	541	323	198	234	e201	e199	278	551	507	1300	764	528
6	541	319	194	248	e193	e205	278	445	543	1340	718	531
7	559	344	197	e222	e195	210	280	508	565	1350	685	551
8	549	320	162	e193	e172	e203	277	572	582	1280	653	484
9	499	312	172	203	e195	205	276	580	702	1180	668	403
10	492	220	169	e200	e209	211	276	582	727	1190	749	461
11	499	269	163	213	e217	216	279	579	735	1190	791	517
12	551	258	154	e341	e216	e209	299	407	718	1240	801	514
13	604	252	178	e288	e198	e212	344	407	726	1270	770	597
14	472	251	169	210	e164	211	455	475	775	1220	772	668
15	417	260	171	212	e162	e214	449	491	823	1160	755	577
16	421	233	200	210	176	217	342	503	837	1110	659	507
17	419	235	194	209	218	e218	331	512	867	1080	649	493
18	420	230	129	210	e201	e209	353	493	862	1000	571	484
19	434	236	156	e199	e187	e201	473	498	843	850	579	478
20	393	231	159	211	e187	e199	477	431	920	856	646	484
21	371	234	168	293	e176	e194	429	377	750	828	641	469
22	378	228	163	295	e176	e190	433	386	569	802	634	463
23	384	221	200	293	e177	193	492	518	603	776	628	457
24	375	278	200	e262	e173	223	571	548	620	758	625	462
25	380	254	174	221	190	218	507	505	668	746	662	494
26	373	258	168	225	211	217	424	408	663	726	663	490
27	317	273	178	225	e207	218	404	439	669	663	673	491
28	310	283	184	227	e206	221	362	369	719	592	677	512
29	315	283	174	228	---	220	363	410	822	554	661	510
30	309	250	276	227	---	227	362	519	955	575	616	499
31	315	---	e264	e200	---	260	---	405	---	549	601	---
TOTAL	13814	8197	5716	7352	5537	6555	10946	14711	20683	31185	20947	15278
MEAN	446	273	184	237	198	211	365	475	689	1006	676	509
AC-FT	27400	16260	11340	14580	10980	13000	21710	29180	41020	61860	41550	30300
MAX	604	395	276	341	264	260	571	582	955	1350	801	668
MIN	309	220	129	193	162	190	275	369	418	549	571	403
CAL YR	2010	TOTAL	160489	MEAN	440	MAX	1270	MIN	129	AC-FT	318300	
WTR YR	2011	TOTAL	160921	MEAN	441	MAX	1350	MIN	129	AC-FT	319200	

MAX DISCH: 1530 CFS AT 21:30 ON JUL 13,2011 GH 4.75 FT SHIFT -0.04 FT

MAX GH: 4.75 FT AT 21:30 ON JUL 13,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06707500 SOUTH PLATTE RIVER AT SOUTH PLATTE
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06707501 SOUTH PLATTE RIVER BELOW STRONTIA SPRINGS
Water Year 2011

Location.--	Lat. N39°26'8"; Long. W105°7'27.3" (NAD83) in Douglas County, CO. Gage is on the right bank approximately 1200 ft. downstream from Strontia Springs Reservoir and 9 mi. SSW from the Chatfield Reservoir dam.
Drainage Area and Period of Record.--	2596 sq. mi. (CDWR Dam Safety database). Daily values are available from CDWR from October 1, 1983 to present.
Equipment.--	Digital incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink2 Data Collection Platform (DCP) and a Steven's A-70 water-stage recorder in a 6 ft. by 6 ft. concrete shelter and stilling well set on bedrock in the channel. An adjustable reference point with graduated tape on the float drive of the recorder is the primary reference with an adjustable reference point and metal drop located below the floor of the shelter, accessible through a manhole and an outside staff gage as supplemental references. A cableway is located approximately 100 ft. below the shelter. The gage is owned and maintained by Denver Water.
Hydrologic Conditions.--	2596 sq. mi. of drainage area heavily influenced by numerous diversions from and transbasin deliveries to the channel as well as several on-stream reservoirs. Flows will reflect extreme basin conditions when the reservoirs are very low or completely full. The gage sits directly below Strontia Springs Reservoir which will completely regulate flows when not spilling. Ice effect is generally not seen due to the gages proximity to the dam.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data and chart record as backup. Instrument calibration was supported this year by twenty-nine visits to the gage by CDWR staff. One instrument correction of -0.01 ft. was made on September 9, 2011 and applied to the record as defined by visits to the gage. The record is complete and reliable except for September 13, 2011 when the inlets were partially plugged and sluggish. The inlets were flushed by Denver Water staff following a gate change made at Strontia Springs.
Datum Corrections.--	Levels were last run on September 23, 2009 using the in-well RP as base. Prior to this date it was believed that running levels on this gage was unnecessary because the stilling well and shelter are cast on bedrock and would thereby be more stable than surrounding features. Three additional reference marks were established at the time levels were run. The primary RP was found to be reading accurately with respect to the in-well RP and associated metal drop tape length.
Rating.--	The control is a boulder and cobble riffle approximately 50 ft. below the gage. The channel grade changes abruptly and significantly approximately 170 ft. below the gage. The riffle is considered the controlling feature for flows up to about 800 cfs. Above this point the channel becomes the control. PLASTRCO04, dated March 19, 2008, defined by measurements up to 1670 cfs was continued in use for all of WY2011. Twenty-five discharge measurements (Nos. 477-501) were made during the year, ranging in discharge from 31.4 to 952 cfs covering the range in stage experienced this year well except higher daily flows on July 2-4 and 7-9, 2011. The peak flow of 1190 cfs occurred at 0315 July 3, 2011 at a gage-height of 5.49 ft. with a shift of -0.03 ft. The peak exceeded high flow Measurement No. 493 made July 2, 2011 by 238 cfs and 0.27 ft. of stage.
Discharge.--	Shifting control method was used all year. Shifts at low flows are variable and generally caused by changes to the rock riffle and vegetal growth. Shifting at moderate flows (GH 3.00-3.80) are caused by scour and fill in the control section below the gage. Shifting a high flow stages is influenced by downstream channel gradients and impedance factors. Shifts were applied by time as defined by measurements with some consideration given to change in stage from October 1, 2010 to March 30, 2011 and from August 8 through September 30, 2011. Variable shift table PLASTRCOVST11.1 was applied from March 30 to August 8, 2011. It is defined by eleven measurements (Nos. 485-495) made during the period of use. Open water measurements showed shifts varying between -0.07 and +0.04 ft. All were given full weight except for Nos. 477, 479, 482, 487, 491, 492 and 500 which were discounted up to ±5% to smooth shift distributions.
Special Computations.--	September 13, 2011 was the only day that required an estimate computation. Because of partially obstructed well inlets, a slower response is seen on the hydrograph as diagonal traces compared to the more vertical line traces seen on unobstructed gage changes. Typically these diagonal traces are seen more frequently on rising stage than a falling stage. It was determined by the dam operator that only two gate changes were made that day. By using straight-line extrapolation of the highest stage value back to the time the release was initially changed, an estimate of daily flow was determined. Strontia Springs Reservoir typically releases constant amounts for long periods of time and this helped to confirm the record. The Caretakers at Strontia Springs Dam rely heavily on the correlation of electrical output of their generators to flow values measured downstream.
Remarks.--	The record is good, except for January 10 and 11, 2011 which is fair due to some degree of suspected ice effect and September 13, 2011 which is estimated and fair. Station maintained and record developed by Tony Arnett.
Recommendations.--	The Strontia—Chatfield gages need to be measured with the highest possible accuracy. Otherwise the shifts can cause bad water balances within the Waterton Canyon and Chatfield systems. These gages need to be operated by experienced personnel who are familiar with stage-shift relationships and the diversion flows that are balanced by gage figures. Frequent measurements at high flows are needed since the channel does change. Additional measurements are particularly desirable around 1000 cfs, as computed flows in this range sometimes do not balance well with downstream gages. The stilling well of this gage needs to be inspected periodically for excessive sediment accumulation as there seems to be an occasional sluggish reaction to gate changes of the Strontia Springs Dam. More frequent intake flushes also may be required to address the stilling well response to changes in water levels. A standard electric tape gage should be placed and used as the base reference.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06707501 SOUTH PLATTE RIVER BELOW STRONTIA SPRINGS

RATING TABLE-- PLASTRC004 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

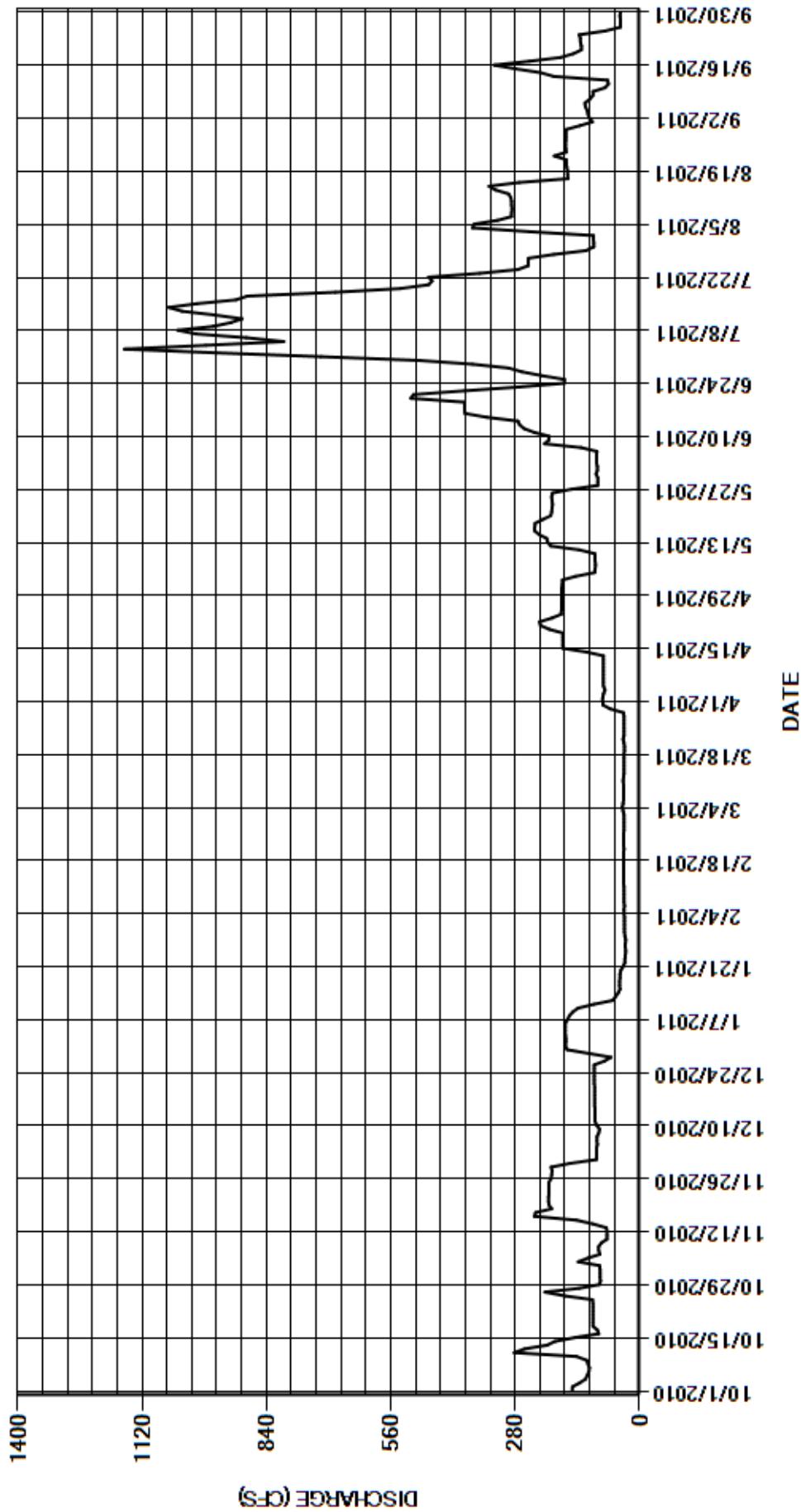
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	151	89	97	166	34	35	83	175	95	717	104	106
2	151	89	97	166	34	35	83	174	95	953	104	113
3	135	90	97	167	34	37	81	174	97	1160	247	116
4	122	138	97	167	35	39	78	144	97	977	376	118
5	118	116	95	167	35	37	81	101	97	801	372	122
6	114	89	96	167	34	36	81	100	96	885	320	123
7	113	92	96	162	35	36	81	99	132	999	288	112
8	116	92	92	158	35	36	81	100	214	1040	288	105
9	119	86	90	150	35	36	81	100	204	960	287	105
10	142	73	96	138	35	36	81	101	204	920	288	78
11	282	73	100	103	35	37	81	136	237	895	288	70
12	259	73	100	61	36	36	81	200	260	956	290	72
13	208	75	100	54	36	35	81	207	270	1030	295	e193
14	190	105	100	48	36	35	119	209	274	1060	324	223
15	145	142	101	44	36	35	173	226	344	996	339	279
16	92	237	101	45	36	35	173	236	393	909	271	327
17	95	234	101	45	36	35	173	236	394	883	161	248
18	105	198	101	44	36	35	173	235	394	685	162	178
19	105	204	101	44	36	34	172	218	394	538	162	149
20	105	205	101	42	36	34	203	200	515	475	164	131
21	105	205	102	37	35	35	223	198	509	467	165	131
22	105	204	102	33	36	37	225	197	393	475	165	133
23	105	204	102	33	36	35	197	196	270	360	192	133
24	105	204	102	32	36	35	176	197	169	274	165	136
25	106	204	102	31	36	35	176	198	169	251	166	78
26	168	199	102	32	35	35	175	196	220	251	167	43
27	213	198	79	32	35	35	176	153	265	250	166	43
28	136	197	64	31	35	35	175	94	295	193	166	43
29	90	199	113	33	---	36	175	94	376	121	166	44
30	88	156	163	34	---	66	175	94	494	103	165	43
31	89	---	167	34	---	82	---	98	---	103	134	---
TOTAL	4177	4470	3157	2500	989	1180	4113	5086	7966	20687	6947	3795
MEAN	135	149	102	80.6	35.3	38.1	137	164	266	667	224	126
AC-FT	8290	8870	6260	4960	1960	2340	8160	10090	15800	41030	13780	7530
MAX	282	237	167	167	36	82	225	236	515	1160	376	327
MIN	88	73	64	31	34	34	78	94	95	103	104	43
CAL YR	2010	TOTAL	60377	MEAN	165	MAX	1000	MIN	32	AC-FT	119800	
WTR YR	2011	TOTAL	65067	MEAN	178	MAX	1160	MIN	31	AC-FT	129100	

MAX DISCH: 1190 CFS AT 03:15 ON JUL 03,2011 GH 5.49 FT SHIFT -0.03 FT

MAX GH: 5.49 FT AT 03:15 ON JUL 03,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06707501 SOUTHPALTE RIVER BELOW STRONTIA SPRINGS
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06708000 SOUTH PLATTE RIVER AT WATERTON
Water Year 2011

Location.--	Lat. 39°29'18", Long. 105°05'32", in NE 1/4 sec. 34, T.6 S., R.69 W., Jefferson County, Hydrologic Unit 10190002. Gage is on the left bank 168 ft. downstream from the bridge on State Highway 221, 0.4 mi. south of Waterton, CO, 4.7 mi. west of Louviers, CO and 6 mi upstream from Plum Creek.
Drainage Area and Period of Record.--	2,620 mi ² (USGS Colorado StreamStats utility). Daily values are available from May 1, 1926 to present.
Equipment.--	Digital incremental Sutron SDR-0001-1 shaft encoder connected to a Sutron SatLink2 Data Collection Platform (DCP) in a 54-inch galvanized corrugated metal pipe shelter and stilling well. The gage is connected to the stream by two 2-inch inlets with flushing apparatuses. The primary reference is an electric tape gage with a supplemental cantilever style chain gage (largely not functional). The gage has power and is equipped with heat lamps to prevent the well from freezing. A bank operated cableway is located approximately 10-ft. upstream. Station is cooperatively operated by Denver Water and the Army Corps of Engineers. On August 30, 2011 the graphic water-stage recorder was removed. A Sutron 56-0540-400-DTR shaft encoder was also replaced by the SDR-0001-1 unit at the same time.
Hydrologic Conditions.--	2620 sq. mi. of drainage area. Streamflows are heavily regulated by numerous diversions, deliveries and on-stream reservoirs above the gage. Flows at this gage are largely determined by operations occurring at Strontia Springs Reservoir and diversions within Waterton Canyon. Denver Water can divert water through Conduit 20, the Highline Canal and the Last Chance Ditch. The Last Chance diversion was new in the 2003 water year. In prior years Denver attempted to maintain a winter flow at Waterton of 30 cfs, but the use of the Last Chance diversion allows Denver's minimum stream flow at Waterton to drop to 15 cfs. This resulted in lower stream flows than have been historically seen at this gage. With the Last Chance ditch running, the FERC minimum stream flow is 15 cfs between September 16 and May 14, and 45 cfs between May 15 and September 15.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP and SDR data and chart record as backup. Instrument calibration was maintained by thirty-seven visits to the gage. Five instrument corrections ranging from -0.01 to +0.01 ft. were made. Corrections were applied by time as defined by visits to the gage. One debris correction of -0.02 ft. was made on April 29, 2011. It was applied by time from the last visit. The record is complete and reliable except for: Nov 25, Dec 12, 18, 19, 23, 26, 28, 2010; Jan 1-31, Feb 1-19, 21-23, and 26, 2011 when the stage-discharge relation was affected by ice and / or the gage-height record was deemed unreliable due to frozen inlets. Two missing values occurring on June 3, 2011 and one missing value on August 30, 2011 were interpolated from adjacent good record without loss of accuracy.
Datum Corrections.--	Levels were last run on September 23, 2009 using R.M. 7 as base. The gage was found to be reading accurately.
Rating.--	The control is a broad crested weir formed by a pipeline crossing approximately 35 feet below the gage. Rating PLA-WATCO10, developed for use in 2007, is defined from about 13 to 2000 cfs was continued in use for the entire water year. Twenty measurements (Nos. 951-970) were made this water year ranging in discharge from 16.6 to 796 cfs covering the range in stage experienced well, except for lower daily flows occurring on January 8, 15 and 16, 2011 and the higher daily flows of July 3, 4, and 7-15, 2011. The peak flow of 1210 cfs occurred at 2300 on July 13, 2011 at a gage height of 2.47 ft with a shift of -0.04 ft. The peak exceeded high flow Measurement No. 964 made on July 2, by 414 cfs and 0.41 feet in stage.
Discharge.--	Shifting control method was for all periods of open water. Shifts are caused by scour and fill of the gage pool, vegetal growth and debris. Shifts were mainly applied by time as defined by measurements. Variable shift table PLA-WATCOVST11-1, defined by nine measurements (Nos. 960-968) made during the period of use, was applied from May 13 to September 2, 2011. Open water measurements showed shifts varying between 0.00 and -0.04 ft. All were given full weight except for Nos. 963 and 968 which were discounted 2.70 and -4.01 percent respectively to smooth shift distributions. Measurements made this year show a slight trend towards negative shifting as stage increases.
Special Computations.--	Visit notes, chart inspection, temperature data and Denver Water's Chatfield Check Sheet were used to determine ice effects and flow estimates. Without visit notes it is difficult to distinguish between ice effect at the gage and diurnal flow due to ice melting in the canyon. Also, ice affect can occur during a warm-up due to floating ice jamming on the control. Discharge for the winter period was estimated from a mass balance spreadsheet accounting for releases made from Strontia Springs Reservoir (PLASTRRCO) minus Denver Water provided diversion record for diversions within Water Canyon. The mass balance estimate was found to be about 5 cfs higher than periods of good record. This offset was incorporated into estimates. These spreadsheets should be used with caution on days of flow change, since Denver's accounting is based on 8am to 8am period rather than midnight to midnight figures.
Remarks.--	The record is good, except for periods of ice affect, which are estimated and fair. Station maintained and record developed by Tony Arnett.
Recommendations.--	The channel and control should be cleared of ice during warm periods in the winter. Levels should be run in the 2012 Water Year.

STATE OF COLORADO
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06708000 SOUTH PLATTE RIVER AT WATERTON

RATING TABLE-- PLAWatco10 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

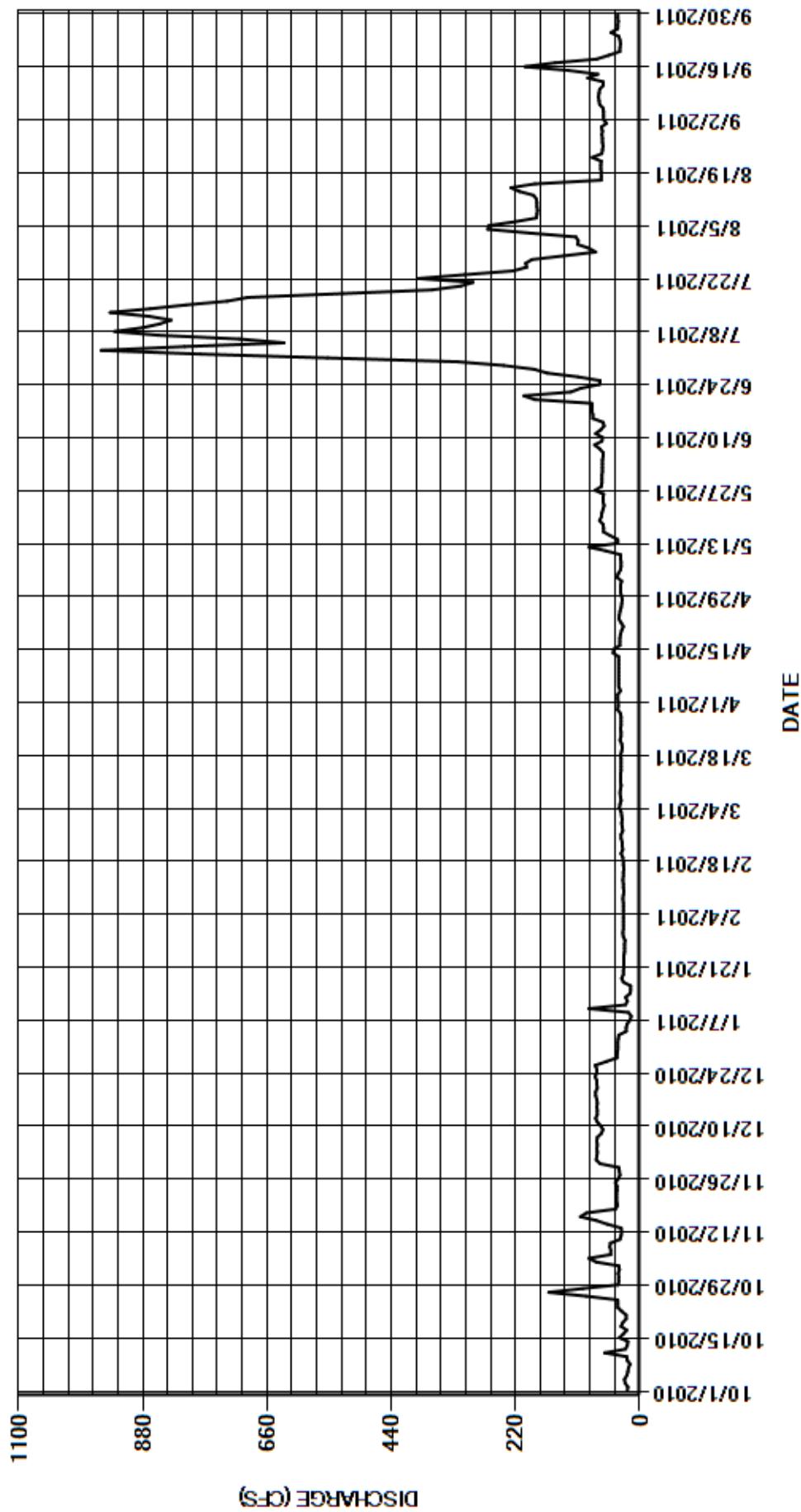
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	38	77	e39	e29	31	38	34	66	553	109	59
2	21	36	76	e38	e29	32	39	34	66	778	113	64
3	26	37	75	e37	e29	33	39	32	66	954	194	64
4	27	77	76	e24	e29	36	34	40	66	806	269	64
5	23	90	75	e24	e29	35	37	38	65	630	267	65
6	21	51	76	e22	e29	33	37	34	65	709	221	71
7	20	51	75	e17	e29	34	37	33	71	853	183	72
8	17	53	68	e15	e30	35	37	33	80	930	182	73
9	22	52	65	e20	e29	34	37	34	67	880	181	72
10	23	35	69	e90	e28	33	37	34	66	850	182	71
11	62	33	75	e25	e29	34	37	60	78	830	182	65
12	25	32	e78	e22	e29	34	37	90	69	869	183	65
13	22	33	75	e25	e30	34	37	39	63	938	188	92
14	21	57	75	e17	e29	33	47	39	65	867	213	74
15	36	77	76	e16	e29	33	46	52	83	804	228	126
16	29	105	75	e16	e28	33	35	64	83	731	186	203
17	23	94	76	e29	e29	33	35	64	85	694	68	150
18	33	43	e78	e32	e29	34	35	65	84	526	68	76
19	30	39	e78	e29	e30	32	34	71	85	367	68	55
20	24	41	75	e29	33	31	32	68	186	317	69	35
21	24	41	76	e28	e30	32	29	67	205	295	69	35
22	32	41	76	e28	e31	35	33	65	122	392	68	34
23	39	40	e79	e28	e31	33	37	63	104	310	84	35
24	39	40	76	e28	33	33	36	65	71	224	67	37
25	39	e43	76	e27	33	34	35	65	70	200	66	51
26	95	38	e79	e27	e30	33	33	64	109	202	65	39
27	161	35	59	e27	31	33	32	79	164	191	66	39
28	101	36	e40	e26	32	33	31	68	187	134	66	38
29	38	37	e40	e29	---	34	32	67	241	78	67	39
30	37	70	e39	e30	---	39	34	67	323	90	66	39
31	37	---	e39	e29	---	38	---	67	---	110	68	---
TOTAL	1169	1495	2172	873	836	1044	1079	1695	3155	17112	4106	2002
MEAN	37.7	49.8	70.1	28.2	29.9	33.7	36.0	54.7	105	552	132	66.7
AC-FT	2320	2970	4310	1730	1660	2070	2140	3360	6260	33940	8140	3970
MAX	161	105	79	90	33	39	47	90	323	954	269	203
MIN	17	32	39	15	28	31	29	32	63	78	65	34
CAL YR	2010	TOTAL	40135	MEAN	110	MAX	833	MIN	17	AC-FT	79610	
WTR YR	2011	TOTAL	36738	MEAN	101	MAX	954	MIN	15	AC-FT	72870	

MAX DISCH: 1210 CFS AT 23:00 ON JUL 13,2011 GH 2.47 FT SHIFT -0.04 FT

MAX GH: 2.47 FT AT 23:00 ON JUL 13,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06708000 SOUTH PLATTE RIVER AT WATERTON
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
SOUTH PLATTE RIVER BELOW CHATFIELD RESERVOIR
Water Year 2011

Location.--	Lat. N39°33'45"; Long. W105°03'35" (NAD83) in Jefferson County, CO Hydrologic Unit 10190002. Gage is located on the left bank 815 ft. downstream from the outlet works of Chatfield Reservoir.
Drainage Area and Period of Record.--	3020 mi ² (USGS Colorado StreamStats utility). Daily values are available from July 26, 1986 to present.
Equipment.--	Digital incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron Satlink2 Data Collection Platform (DCP) and a Steven's A-70 water-stage recorder in a 6 ft. by 6 ft. concrete block shelter overtop a 60 in. concrete stilling well approximately 50 ft. upstream of a low head concrete dam. The well is connected to the channel via three 4 inch intakes equipped with flushing apparatuses. An electric tape gage placed on the instrument shelf is the primary reference with no provisions for an outside supplemental reference. A cableway is located approximately 30 ft. upstream from the gage. The gage is owned by the Army Corps of Engineers and maintained by the Colorado Division of Water Resources.
Hydrologic Conditions.--	3020 sq. mi. of drainage area heavily regulated by diversions from and deliveries to the channel, including transbasin imports via Roberts Tunnel (ROBTUNCO) as well as several on-channel reservoirs upstream of the gage. All flows at the gage are regulated by Chatfield Reservoir, 815 ft. upstream. Releases from Chatfield Reservoir during flood events are regulated to limit the total flow at the Henderson gage (PLAHENCO) to about 5000 cfs. There are no minimum streamflow requirements below Chatfield Reservoir. Flows will periodically go to zero for short to prolonged periods.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data and chart record as backup. Twenty-four visits made to the gage by DWR personnel showed good agreement between the base reference and instrumentation. The record is complete and reliable. Missing satellite data values on June 3 and September 2, 2011 during routine maintenance of the satellite equipment were interpolated from adjacent good record without loss of accuracy. Due to the gage's proximity to the reservoir ice accumulation is generally not an issue. Algal growth in the gage pool can affect the gage's performance. Large algal plumes were not noted this year.
Datum Corrections.--	Levels were last run on September 23, 2009 using R.M. 1 as base. Levels showed the new elevation of the ETG to be 0.12 ft. higher at 20.090 ft. confirming levels run on July 26, 2006. No corrections were made as shifts are generally computing near zero. Further investigation needs to be done to determine if the gage datum should be changed.
Rating.--	The control is a massive low head sloped concrete dam approximately 50 feet below the gage in a deep stilling basin extending about 800ft. back to the reservoir outlet pipe. Measurement conditions near the gage are not good. The channel is very rocky and flow is deep and often extremely slow. The initial and subsequent ratings have incorporated a lot of scatter in the measurements. Variations in shifts at lower (wading) flows are probably more due to measurement error rather than conditions affecting the control. If enough measurements are made with the highest possible precision, it should be possible to develop a table that does not require shifts, or measurements at lower flows. In fact, shift variations at low flows have at times made administration of the release problematic. Rating PLACHACO03, well defined to about 2500 cfs, was continued in use for all of WY2011.
Discharge.--	Seventeen discharge measurements (Nos. 421- 437) were made during the year ranging in discharge from 27.7 to 992 cfs. Measurements Nos. 421-437 and four observations of no flow cover the range in stage experienced this year well. The peak flow of 1010 cfs occurred at 1545 on July 14, 2011 at a gage-height of 4.01 ft. with a shift of 0.00 ft. The peak exceeded high flow Measurement No. 432 made July 15, 2011 by 18 cfs and 0.02 ft. of stage.
Special Computations.--	Shifting control method was used all year. Shifts are caused by algal growth in the stilling basin, accumulation of debris on the control and some ambiguity in the rating combined with some degree of measurement error. Shifts were prorated by time with consideration given to change in stage from October 1, 2010 through March 21, 2011. Variable shift table PLACHACOVST11-1, defined by twelve measurements (Nos. 424-435) made during the period of use was applied from March 21 through September 2, 2011. Shifts were prorated by time as defined by measurements from September 2 through the end of the water year. Open water measurements made this year showed shifts varying between -0.06 and +0.04 ft. All were given full weight except for Nos. 430, 433 and 435 which were discounted -1.75 , 3.27 and -3.95% respectively to smooth shift distributions.
Remarks.--	The record is good. Zero flow is determined operationally. Station maintained and record developed by Tony Arnett.
Recommendations.--	Cableway markings should be verified using a tagline at water level and a horizontal tape strung between the A-Frames. Vegetative growth in the stilling pool should be observed. Levels should be run to confirm elevations of the RM's and PZF, and reconcile any tape length problems.

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SOUTH PLATTE RIVER BELOW CHATFIELD RESERVOIR

RATING TABLE-- PLACHACO03 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

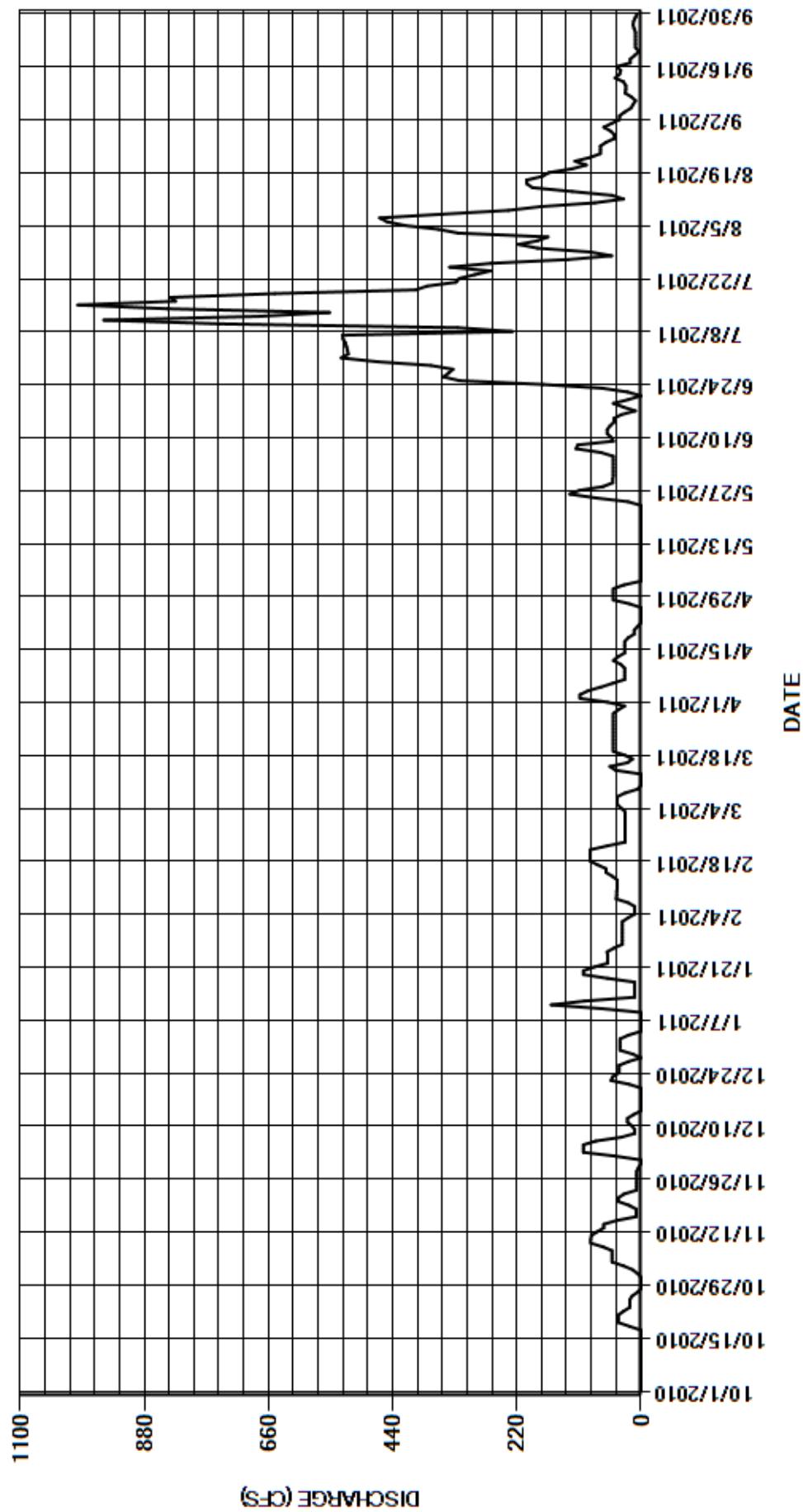
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	6.4	0.00	37	33	28	59	49	49	531	183	52
2	0.00	15	45	37	33	28	108	30	49	519	165	38
3	0.00	31	102	22	23	28	108	0.00	49	520	324	38
4	0.00	51	102	0.00	11	35	94	0.00	49	522	359	29
5	0.00	51	102	0.00	11	42	71	0.00	49	524	418	18
6	0.00	51	80	0.00	11	42	50	0.00	71	528	450	14
7	0.00	51	35	0.00	23	42	29	0.00	115	529	463	9.5
8	0.00	67	11	0.00	44	28	29	0.00	112	228	352	17
9	0.00	89	11	0.00	43	6.1	29	0.00	49	325	235	28
10	0.00	89	16	70	43	0.00	29	0.00	53	748	178	27
11	0.00	88	24	159	42	0.00	36	0.00	60	952	82	27
12	0.00	78	24	100	42	0.00	49	0.00	60	676	31	31
13	0.00	66	13	11	42	0.00	41	0.00	55	552	52	46
14	0.00	66	0.00	11	51	45	29	0.00	48	839	122	38
15	0.00	43	0.00	11	62	55	29	0.00	48	998	192	36
16	0.00	8.5	0.00	11	62	24	29	0.00	35	825	202	43
17	0.00	8.5	0.00	11	77	15	29	0.00	10	834	203	19
18	20	8.5	0.00	59	90	29	23	0.00	31	649	175	19
19	40	21	0.00	102	90	49	12	0.00	49	399	163	11
20	40	40	0.00	102	90	49	12	0.00	22	379	122	3.5
21	40	40	21	83	90	49	6.3	0.00	0.00	328	97	9.6
22	31	30	53	59	60	49	0.00	0.00	24	322	117	9.6
23	20	8.0	50	59	28	49	0.00	0.00	69	295	90	9.6
24	20	7.8	39	59	28	49	0.00	23	174	267	72	9.6
25	20	7.8	39	60	28	49	0.00	80	322	339	72	9.6
26	16	7.7	39	48	28	49	0.00	126	350	266	72	12
27	6.4	7.6	22	33	28	49	20	109	341	129	62	14
28	0.00	7.5	0.00	33	28	49	49	67	333	52	47	13
29	0.00	4.2	15	33	---	49	49	50	372	90	47	10
30	0.00	0.00	37	33	---	40	49	50	467	183	54	6.6
31	0.00	---	37	33	---	29	---	49	---	217	66	---
TOTAL	253.40	1049.50	917.00	1276.00	1241	1055.10	1068.30	633.00	3515.00	14565	5267	647.6
MEAN	8.17	35.0	29.6	41.2	44.3	34.0	35.6	20.4	117	470	170	21.6
AC-FT	503	2080	1820	2530	2460	2090	2120	1260	6970	28890	10450	1280
MAX	40	89	102	159	90	55	108	126	467	998	463	52
MIN	0.00	0.00	0.00	0.00	11	0.00	0.00	0.00	0.00	52	31	3.5
CAL YR	2010	TOTAL	51956.62	MEAN	142	MAX	1400	MIN	0.00	AC-FT	103100	
WTR YR	2011	TOTAL	31487.90	MEAN	86.3	MAX	998	MIN	0.00	AC-FT	62460	

MAX DISCH: 1010 CFS AT 15:45 ON JUL 14,2011 GH 4.01 FT SHIFT 0 FT

MAX GH: 4.01 FT AT 15:45 ON JUL 14,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH PLATTE RIVER BELOW CHATFIELD RESERVOIR
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06710500 BEAR CREEK AT MORRISON
Water Year 2011

Location.--	Lat. N39° 39' 10.60"; Long. W 105° 11' 44.13" (NAD83) Jefferson County, Hydrologic Unit 10190002. Gage is on the left bank of the creek, 180 ft. upstream from bridge on State Highway 8 and 0.2 mi upstream from Mount Vernon Creek.
Drainage Area and Period of Record.--	164 mi ² . Sporadic, incomplete data Sep. 1881 to Feb. 1902. Good data October 1919 to current year. Monthly data for some periods only. Some early years published as near Morrison, at Starbuck (Starbuck Heights, pre-1933), at Idledale.
Equipment.--	Digital incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink Data Collection Platform (DCP) in a 60-inch metal pipe shelter overtop a 48-inch stilling well at a compound weir. A metal drop tape and adjustable reference point serve as the primary reference. A supplemental cantilever chain gage is present. A bank operated cableway is located upstream of the gage. The float for the encoder resides inside a cylinder tube containing Isopar (an anti-freezing agent). The back-up chart recorder is in the well itself and prone to freezing.
Hydrologic Conditions.--	The Bear Creek drainage is a mix of mountains and urban landscape. It extends from the mountains near Mt. Evans down to the City of Sheridan before entering the S. Platte River. In the summer of 2005, the Town of Morrison constructed a new bike path along the creek and past the gage. It does not seem to be affecting the gage or nearby creek banks in a negative manner.
Gage-Height Record.--	The primary record is 15-minute satellite monitoring data with DCP log and chart record as backup. The record is complete and reliable, except for: November 22, 2010–March 1, 2011, when the stage-discharge relationship was affected by ice; and, Aug 28-29 when trash stuck in the Cipolletti notch caused a variable backwater effect. Missing values on July 17, 22 - 24, August 5 and 9, 2011 were filled in with chart record without loss of accuracy.
Datum Corrections.--	Levels were last run in 2008. No corrections were made.
Rating.--	The control is a compound weir consisting of a broad crested concrete wall with a six-foot sharp-crested Cipolletti notch (one-foot deep) for low flows. Rating No. 23 was developed from the standard Cipolletti for the first foot and from measurements made in 2003 above the first foot. The rating shows a break in slope around 6.00 ft as flow goes above the notch and out over the much wider section of broad crested weir. Rating 23 is defined by measurements to 346 cfs, but it is not well defined around 6.00 ft where the flow transitions from the notch to the concrete weir. Eighteen Measurements (Nos. 1004-1021), ranging in discharge from 7.5 to 124 cfs were made this year. The peak flow of 166 cfs occurred at 1830 on July 14, 2011 at a gage height of 6.92 ft with a shift of 0.00 ft. It exceeded measurement No.1015, made June 20, 2011 by 0.09 ft in stage.
Discharge.--	Shifting control method was used this year. Shifts are caused by scour and fill in weir pool and by ice-affect in the winter. Shifts generally have been negative at high and low stages and zero in the middle. Measurements show unadjusted shifts varying from -0.05 to 0.03 ft. Shifts were distributed by time with consideration of stage for the entire water year. Measurements 1006, 1009 and 1012 were adjusted up to 2% to smooth distribution.
Special Computations.--	Flows in the winter are often less than 25 cfs, and as such are contained 100% within the Cipolletti notch. No changes were made to the final flow calculations. However, with ice observations and temperature records, a determination was made to flag the days where ice affect is likely during this winter period, November 22, 2010 through March 1, 2011.
	Daily flow estimate were applied in lieu of a gage height correction of -0.32 ft. which occurred on August 28 and 29, 2011 when a 2x10 board was found stuck in the control notch. The line trace on the graph would indicate movement of the board as the stage changes. Estimates were applied to the daily flows rather than determining gage heights.
Remarks.--	The record is good except for the following periods: November 22, 2010 through March 1, 2011 is poor due to ice; August 28 and 29 are estimated and fair as a result of lumber on the control. Station maintained and record developed by Tony Arnett.
Recommendations.--	A new rating table may be necessary for higher flows (i.e. flows above 200 cfs). A series of measurements should be focused around gage heights where flow transitions out of the Cipolletti weir notch in order to better define the rating. An outside gage has been installed but needs to be tied in with BM. Also, it would be a good idea to check the highway bridge for a MSL benchmark and tie the control BM back to sea level.

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OFFICE OF STATE ENGINEER

06710500 BEAR CREEK AT MORRISON

RATING TABLE.-- BCRMORCO23 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

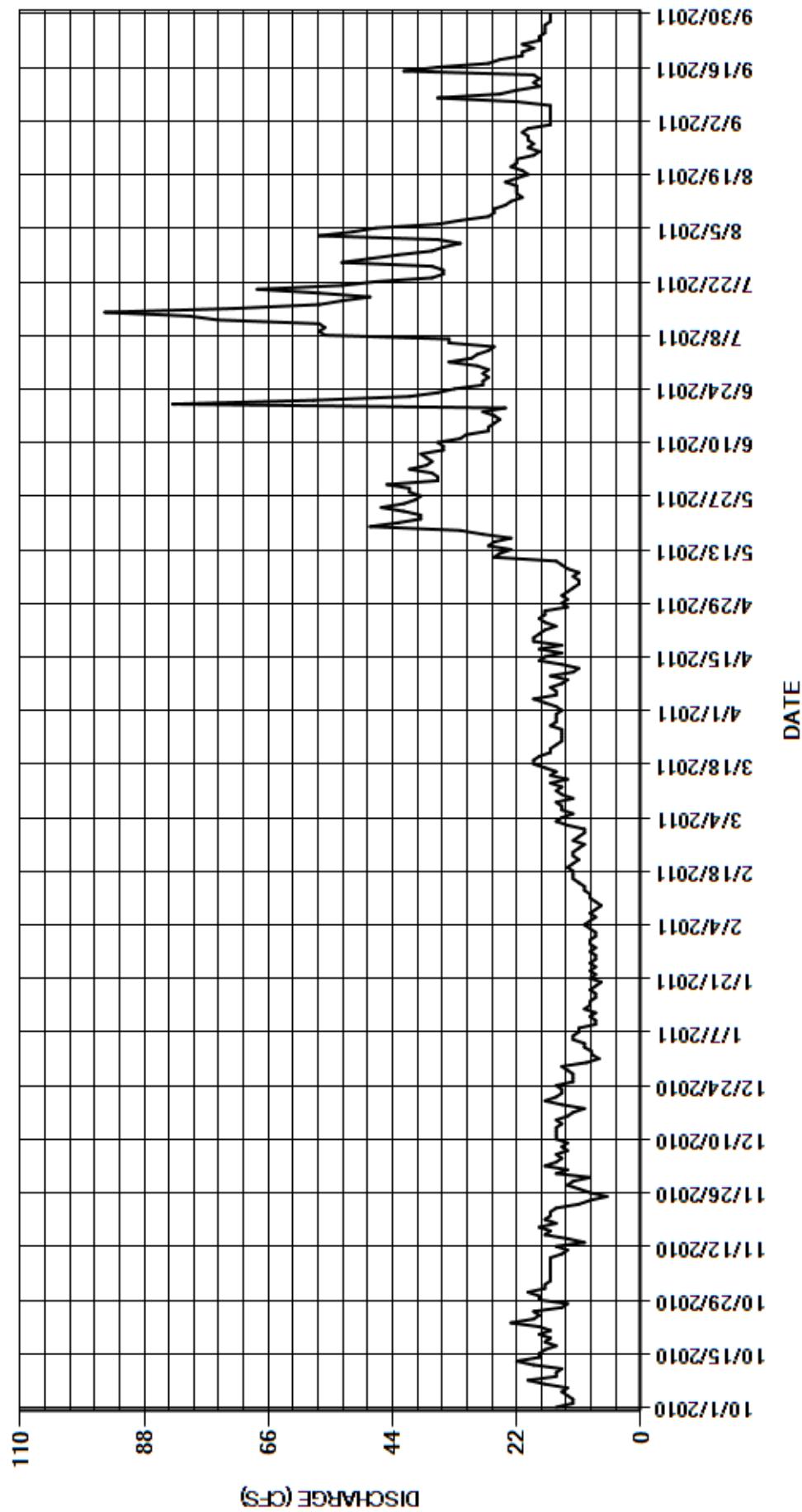
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	17	15	8.6	e8.0	e10	14	14	36	34	32	16
2	12	17	13	8.8	e8.0	13	15	13	37	30	36	16
3	12	16	17	e10	e9.0	15	17	12	41	29	57	16
4	13	16	15	e10	e10	14	19	11	38	27	51	16
5	14	16	14	e12	e9.0	12	15	11	37	26	47	16
6	13	16	15	e12	e8.0	14	15	12	38	34	36	16
7	17	16	13	e11	e9.0	14	16	11	39	34	32	22
8	20	16	14	e11	e8.0	15	14	13	35	56	27	36
9	15	16	13	e8.0	e7.0	12	13	14	35	57	26	25
10	15	14	15	e8.0	e8.0	14	16	15	36	56	26	22
11	14	13	15	e9.0	e9.0	15	12	26	32	57	24	18
12	19	15	e15	e8.0	e9.0	14	11	25	31	75	23	19
13	22	10	15	e10	e10	16	14	23	27	80	21	18
14	18	13	14	e9.0	e10	13	18	27	27	95	22	19
15	18	17	15	e9.0	e11	16	17	26	26	72	22	42
16	17	16	13	e8.0	e12	15	14	23	25	57	22	36
17	15	18	12	e8.0	e12	17	18	28	26	53	24	27
18	17	15	10	e9.0	e12	19	14	32	28	48	22	25
19	16	17	14	e8.0	e13	19	19	48	24	57	20	21
20	18	16	17	e7.0	e12	18	19	43	83	68	21	21
21	16	16	15	e9.0	e11	16	18	39	58	53	23	19
22	18	e15	14	e8.0	e12	16	17	39	41	47	22	21
23	23	e11	14	e9.0	e12	15	15	42	36	37	22	18
24	19	e9.0	15	e8.0	e11	14	17	46	33	35	19	18
25	18	e6.0	12	e9.0	e10	14	18	42	28	35	18	17
26	19	e9.0	12	e8.0	e12	14	17	40	28	37	20	17
27	14	11	e12	e8.0	e11	14	17	39	27	53	19	17
28	13	13	e13	e9.0	e10	16	13	41	28	48	e20	16
29	18	e12	14	e8.0	---	15	14	41	27	43	e20	16
30	18	e9.0	9.6	e9.0	---	15	13	45	29	37	21	16
31	20	---	7.4	e9.0	---	15	---	36	---	35	20	---
TOTAL	516	421.0	422.0	278.4	283.0	459	469	877	1036	1505	815	622
MEAN	16.6	14.0	13.6	8.98	10.1	14.8	15.6	28.3	34.5	48.5	26.3	20.7
AC-FT	1020	835	837	552	561	910	930	1740	2050	2990	1620	1230
MAX	23	18	17	12	13	19	19	48	83	95	57	42
MIN	12	6.0	7.4	7.0	7.0	10	11	11	24	26	18	16
CAL YR	2010	TOTAL	12594.0	MEAN	34.5	MAX	156	MIN	6.0	AC-FT	24980	
WTR YR	2011	TOTAL	7703.4	MEAN	21.1	MAX	95	MIN	6.0	AC-FT	15280	

MAX DISCH: 166 CFS AT 18:30 ON JUL 14,2011 GH 6.92 FT SHIFT 0 FT

MAX GH: 6.92 FT AT 18:30 ON JUL 14,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06710500 BEAR CREEK AT MORRISON
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06711500 BEAR CREEK AT SHERIDAN
Water Year 2011

Location.--	Lat. N39°39'8.3"; Long. W105°1'58.6" (NAD83) Arapahoe County, CO Hydrologic Unit 1019002. Gage is on the left bank downstream from the intersection of S. Lowell Blvd. and US HWY 285, 2.5 miles northwest of Marston Lake.
Drainage Area and Period of Record.--	261 mi ² (USGS Colorado StreamStats utility). Daily values are available from March 1, 1927 to present.
Equipment.--	Digital incremental Sutron SDR-0001-1 shaft encoder connected to a Sutron SatLink2 Data Collection Platform (DCP) in a 42-inch corrugated metal pipe shelter and stilling well at a concrete shrouded boulder and rubble control. Well is connected to a stream by two 2-inch intakes with flushing equipment. An adjustable reference point and metal drop tape is the primary reference with no provisions for a supplemental reference.
Hydrologic Conditions.--	Stream is heavily regulated upstream by numerous diversions and Bear Creek Lake, an on-stream reservoir 6-miles upstream from gage. Flow conditions are generally steady due to the regulation of the creek by Beak Creek Reservoir; however, the area around the gage is urban. Hardened surfaces around the gage and recently introduced storm water culverts near the gage cause sharp peaks following rain events.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged SDR and DCP data as backup. Instrument calibration was supported by twenty-six visits to the gage. One instrument correction of +0.01 ft. was made on August 29, 2011 and was applied to the record as defined by visits made to the gage. The record is complete and reliable except for November 30 through December 3, 2010 when the inlets were frozen and January 11-15 and February 1-13, 2011 when the stage-discharge relation was affected by ice. The gage is flushed often to prevent plugging of the inlets. Two flush corrections of -0.02 ft and +0.03 ft were made on February 17 and March 17, 2011. The gage-height record was adjusted from the point of the correction back to the last inflection point on the hydrograph. Accumulation of debris on the control can affect the gage -height record. This year, debris removal corrections were -0.01 ft. or less. Further evaluation and adjustment to the record was not made. One missing values on October 19, 2010 was interpolated from adjacent record without loss of accuracy.
Datum Corrections.--	Levels were last run on July 26, 2006 using RM 5 as base. No correction was made.
Rating.--	The control for all stages is a concrete shrouded boulder and rubble pile approximately 10-ft. below the gage. Backwater conditions have never been observed. Rating BCRSHECO32, developed in 1998, was continued in use for all of WY2011. The rating is defined by measurement to 661 cfs but has been extrapolated to 3000 cfs to accommodate transient peaks. Flows above 1000 cfs need to be considered estimates and rated as poor without confirming measurements. Eighteen measurements (Nos. 990-1007) were made this year ranging in discharge from 7.00 to 137 cfs, covering the range in stage experienced this year well except for: the lower daily flows of December 15-20, 23-25, 27-30, 2010; January 1, 25, 26, 28-February 1, March 12-15, 2011 and the higher daily flows of July 13 and 14, 2011. The peak flow of 594 cfs occurred at 2145 on July 12, 2011 at a gage-height of 4.58 ft. with a shift of 0.00 ft. The peak exceeded high flow Measurement No. 1001 made on June 20, 2011 by 457 cfs and 1.29 ft. of stage.
Discharge.--	Shifting control method was used all year. Shifts are caused by fill and scour of pool upstream of the control and materials passing over the control. Shifts were distributed by time as defined by measurements with some consideration given to change in stage. Open water measurements showed shifts varying between -0.03 and +0.02 ft. All measurements were given full weight except for Nos. 991, 994, 998, 1000 and 1004 which were discounted 10%, 6%, 3%, -5% and -5% respectively to smooth shift distributions.
Special Computations.--	Discharge for the periods of frozen inlets and period of ice affect were estimated from adjacent good record with consideration given to outflows from Bear Creek Lake (BCROUTCO) and temperature trends recorded at the Morrison (BCRMORCO) gage.
Remarks.--	The record is good, except for periods of frozen inlets and ice affected record which are estimated and poor; December 4 through 14 and December 30, 2010 through January 5, 2011 which is fair, due to uncertainty in the accuracy of the record due to lack of visits and observations made to the gage; and the peak event, which is fair due to lack of definition and recent confirming measurements. Station maintained and record developed by Tony Arnett.
Recommendations.--	Continue visits every two weeks to ensure the control stays clear of debris, especially after rain events. If possible, extra visits should be made during extreme cold to break ice in the well. Light construction should be done to remove the catch points on the control to help with debris affecting gage height. Levels should be run as that has not been done since 2006. Pictures should also be taken of the interior of the gage since new equipment installation. Rating above 1000 cfs needs to be confirmed by slope-area or some other indirect method.

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06711500 BEAR CREEK AT SHERIDAN

RATING TABLE-- BCRSHECO32 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

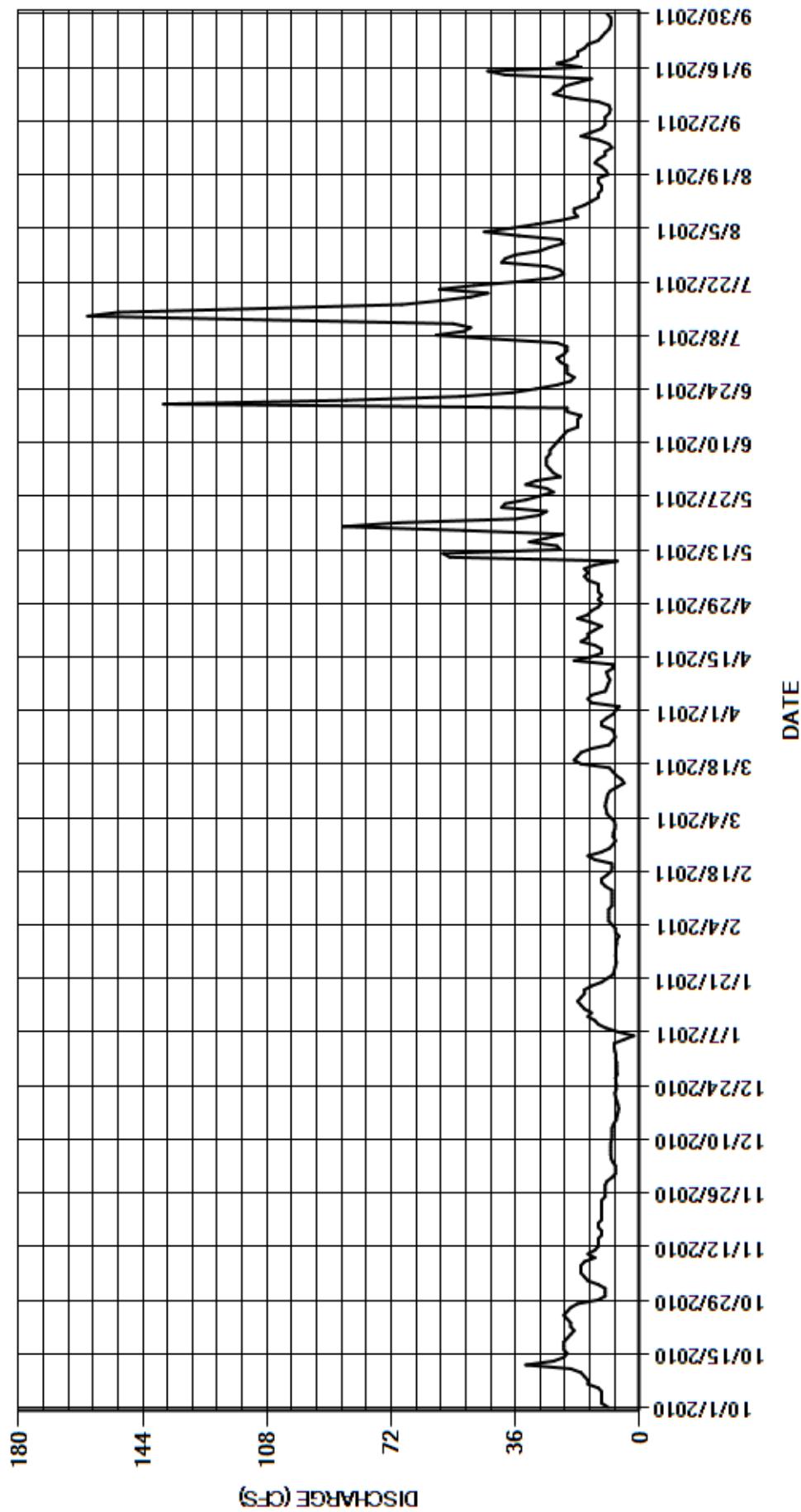
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.2	10	e7.0	6.9	e6.0	7.2	7.0	11	23	23	22	10
2	11	12	e7.0	7.2	e7.0	7.1	5.9	12	25	24	23	10
3	11	15	e7.0	7.4	e7.0	7.3	14	12	26	22	35	10
4	11	16	7.8	7.4	e8.0	8.5	15	12	27	21	45	8.8
5	11	17	8.3	4.6	e9.0	9.5	14	15	27	21	37	8.5
6	12	17	8.4	1.7	e9.0	9.7	10	16	27	24	30	8.9
7	15	17	8.4	6.2	e9.0	10	9.5	15	26	42	23	12
8	15	16	8.4	9.7	e9.0	9.8	9.1	16	26	59	18	20
9	16	13	8.4	12	e8.0	9.5	8.6	13	25	51	19	25
10	17	15	8.1	13	e8.0	9.3	9.3	6.5	24	49	19	23
11	20	13	8.0	e15	e8.0	8.5	9.6	55	23	54	16	22
12	33	12	8.0	e14	e8.0	6.5	7.8	57	22	108	14	18
13	25	12	8.0	e16	e8.0	4.5	7.8	23	21	160	12	14
14	22	12	7.5	e17	9.9	5.3	19	24	18	151	12	39
15	21	11	6.8	e18	11	6.8	14	32	18	109	11	44
16	22	11	6.6	17	11	7.8	11	27	18	69	11	17
17	22	12	6.3	16	9.5	8.8	11	22	17	58	12	24
18	22	12	6.1	16	8.2	17	13	51	21	49	12	20
19	21	11	6.3	14	8.0	19	17	86	21	44	9.2	18
20	20	11	6.7	11	8.1	18	15	70	138	58	9.8	18
21	19	11	7.0	9.4	13	17	15	36	85	48	11	16
22	20	11	7.2	7.7	15	14	13	29	52	35	13	15
23	20	11	6.8	7.4	11	8.9	11	27	37	25	12	12
24	21	11	6.7	7.1	8.7	8.0	14	40	30	22	10	11
25	22	10	6.9	6.8	7.7	7.1	18	39	24	23	10	10
26	21	10	7.0	6.9	7.0	7.4	15	33	20	27	8.0	8.9
27	20	10	6.5	7.0	7.7	8.0	14	29	19	40	9.0	8.4
28	18	10	6.7	6.9	7.6	11	12	25	21	39	12	8.3
29	12	9.5	6.7	6.9	---	11	11	27	21	36	17	8.4
30	10	e8.0	6.7	6.7	---	9.6	12	33	21	29	14	9.5
31	10	---	7.0	6.7	---	7.7	---	30	---	26	11	---
TOTAL	549.2	366.5	224.3	309.6	247.4	299.8	362.6	923.5	903	1546	517.0	477.7
MEAN	17.7	12.2	7.24	9.99	8.84	9.67	12.1	29.8	30.1	49.9	16.7	15.9
AC-FT	1090	727	445	614	491	595	719	1830	1790	3070	1030	948
MAX	33	17	8.4	18	15	19	19	86	138	160	45	44
MIN	9.2	8.0	6.1	1.7	6.0	4.5	5.9	6.5	17	21	8.0	8.3
CAL YR	2010	TOTAL	18116.7	MEAN	49.6	MAX	408	MIN	6.1	AC-FT	35930	
WTR YR	2011	TOTAL	6726.6	MEAN	18.4	MAX	160	MIN	1.7	AC-FT	13340	

MAX DISCH: 594 CFS AT 21:45 ON JUL 12,2011 GH 4.58 FT SHIFT 0 FT

MAX GH: 4.58 FT AT 21:45 ON JUL 12,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06711500 BEAR CREEK AT SHERIDAN
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06714000 SOUTH PLATTE RIVER AT DENVER
Water Year 2011

Location.--	Lat. N39°45'34", Long. W105°0'14.42" (Spotted from Google Earth). Gage is located on the right bank at a grouted rock dam 110-ft. upstream from the 18th Street Bridge, 0.4 mi. downstream from the confluence with Cherry Creek and 1.75 miles NW of the Capitol Building in Denver, CO.
Drainage Area and Period of Record.--	3860 sq. mi. (USGS Colorado StreamStats utility). Daily values are available from July 1, 1895 to present.
Equipment.--	Digital incremental Sutron 8500 shaft encoder connected to a high data rate capable Sutron 8210 Data Collection Platform (DCP) transmitting hourly and a Stevens A-35 water-stage recorder in a 6-ft. by 6-ft. precast concrete shelter overtop a 60-in. corrugated metal pipe stilling well at a grouted rock dam. The well is connected to the channel by three 2-inch inlets equipped with flushing apparatuses. A potable water line is plumbed into the shelter for flushing the inlets. An electric tape gage located in the shelter is the primary reference with a cantilever style wire weight gage as a supplementary reference. The Urban Drainage and Flood Control District contracts OneRain Inc. and the USGS to operate early warning flood detection instrumentation and a water quality sampler respectively at the gage.
Hydrologic Conditions.--	3860 sq. mi. of drainage area of varying topography. Gage is located approximately 0.4 miles downstream from the confluence of the South Platte River and Cherry Creek. The channel is heavily regulated upstream of the gage by numerous diversions, reservoirs and inflows to the system. Gage is subject to rapid changes in stage resulting following storm events in the Denver area from hardened surfaces draining to the river. The channel is principally composed of gravels and sand that are continually scouring and filling in the gage pool formed by the control, causing both positive and negative shifts. Directly across the channel from the gage, and above the control, is a spillback gate for the Farmers and Gardeners Ditch. The spillback chute to the river is very steep and flows are shallow, turbulent, air entrained, extremely fast and practically not measureable with Price meters. During routine operation of the ditch, this flow is often estimated at about 10 cfs. The ditch rider states that the headgate will draw about 35 cfs from the river and the ditch is decreed at 24 cfs. The remainder is spilled.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data and chart record as backup. Instrument calibration was maintained by twenty-three visits to the gage by DWR staff. The record is complete and reliable.
Datum Corrections.--	Levels were run on October 13 and 17, 2011 prior to and after replacement of the shelter's roof panel and instrument shelf. Levels run on October 13, 2011, using R.M. 1 as base, showed that the primary reference was 0.036 ft. high and was not corrected. No corrections were made to gage-heights of measurement or the gage-height records. Levels run on October 17, 2011 following replacement of the instrument shelf, established the primary reference at a new elevation of 19.786 ft. using R.M.9 as base.
Rating.--	The control of all expected flows is a grouted rock dam approximately 50-ft. below the gage. Rating PLADENCO34, in use since October 1, 2008, was continued in use for all of WY2011. It is defined by measurements from 39.4 to 5340 cfs and was extended to 12600 cfs using a peak flow on July 25, 1998 that was indirectly calculated using records from downstream gages. Twenty measurements (Nos. 1003-1022) were made during the year, ranging in discharge from 80.1 to 2800 cfs covering the range in stage experienced this year well. The peak flow of 6590 cfs occurred on at 2315 on July 12, 2011 at a gage-height of 8.72 ft. with a shift of +0.04 ft. The peak exceeded high flow Measurement No. 1016 made June 20, 2011 by 3790 cfs and 2.20 ft of stage. Peak events at this gage often occur as sharp, transitory rises in the evenings after thunderstorm events, defying measurement.
Discharge.--	Shifts are mainly caused by scour and fill of materials in the pool created by the control structure, vegetal growth and debris on the control. Shifting control method was used all year. Shifts were distributed mainly by time as defined by measurements with some consideration given to change in stage. Variable shift table PLADENCOVST11-1, defined by four measurements (Nos. 113-116) made during the period of use was applied from May 12, 2011 (1200) to June 20, 2011 (0700). Variable shift table PLADENCOVST11-2 defined by three measurements (Nos. 116-118) made during the period of use was applied from June 20, 2011 (0715) to July 28, 2011 (1430). Open water measurements show shifts varying from -0.06 to +0.04 ft. All were given full weight except for Nos. 1003, 1010 and 1017 which were discounted up to \pm 4% to smooth shift distributions.
Special Computations.--	None.
Remarks.--	The record is good, except for the peak which is fair. Station maintained and record developed by Tony Arnett.
Recommendations.--	Continued efforts to measure peak events should be strived for. Measurements should be made shortly after events. Levels must be run in the 2012 Water Year to confirm establishment and stability of the primary reference.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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06714000 SOUTH PLATTE RIVER AT DENVER

RATING TABLE-- PLADENCO34 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

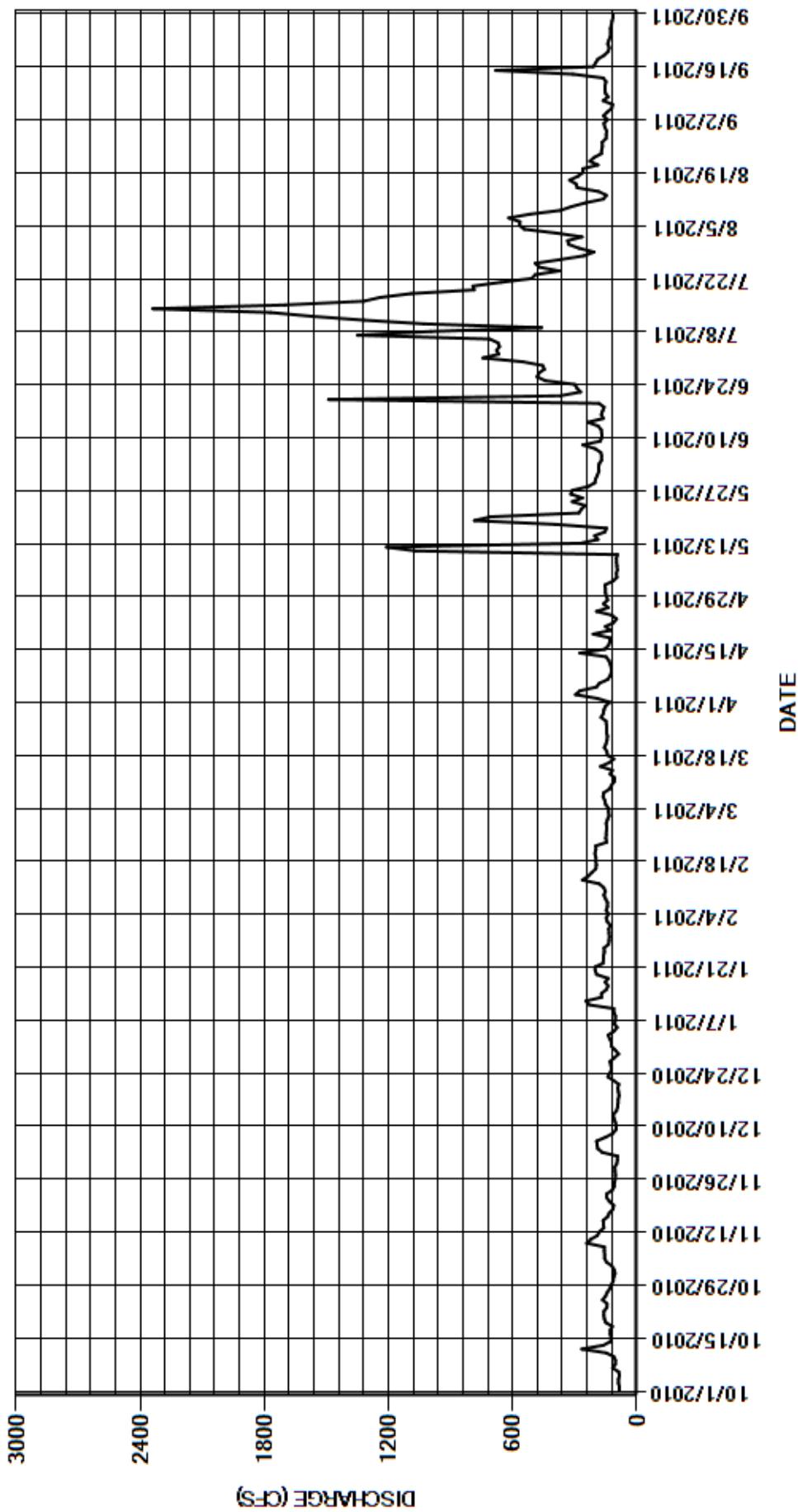
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	84	105	94	122	128	142	131	152	183	744	334	159
2	84	110	93	131	143	134	191	154	185	667	265	142
3	89	121	167	139	148	137	296	115	182	678	389	161
4	89	147	189	111	137	138	275	96	170	664	543	143
5	84	156	192	95	148	151	195	99	170	671	567	121
6	88	156	194	108	142	155	181	94	174	712	565	117
7	117	157	151	103	141	163	141	96	201	1350	619	163
8	104	157	116	103	151	161	129	98	261	996	517	139
9	103	242	101	111	159	133	123	99	177	460	369	152
10	111	223	99	111	152	123	123	93	169	1030	316	154
11	148	191	104	230	160	109	128	1070	170	1320	247	154
12	266	181	111	246	182	107	135	1210	172	1570	161	149
13	162	160	114	170	263	129	149	273	187	1770	147	162
14	126	161	98	171	235	118	275	188	237	2340	185	308
15	124	163	93	148	217	176	155	204	162	1700	288	682
16	129	141	91	139	198	134	137	155	172	1320	294	210
17	129	133	90	153	196	111	130	146	165	1240	325	199
18	118	115	86	138	198	142	130	395	158	1090	285	188
19	150	112	89	194	198	145	211	785	183	786	261	158
20	157	132	92	201	203	157	127	708	1490	792	262	139
21	160	145	87	202	198	149	152	280	369	656	188	133
22	159	146	113	163	199	144	113	268	272	508	227	141
23	145	119	140	162	145	142	98	250	289	491	206	135
24	144	109	129	161	150	147	121	312	300	375	171	128
25	166	108	122	157	148	145	195	263	443	471	170	126
26	151	104	125	159	147	147	138	319	482	491	166	128
27	143	104	130	137	146	149	161	312	474	370	168	123
28	131	105	109	134	148	173	141	235	447	256	149	120
29	123	107	88	133	---	162	147	203	455	207	148	115
30	114	97	104	134	---	159	152	199	553	279	146	115
31	112	---	122	136	---	151	---	191	---	329	155	---
TOTAL	4010	4207	3633	4602	4780	4433	4780	9062	9052	26333	8833	5064
MEAN	129	140	117	148	171	143	159	292	302	849	285	169
AC-FT	7950	8340	7210	9130	9480	8790	9480	17970	17950	52230	17520	10040
MAX	266	242	194	246	263	176	296	1210	1490	2340	619	682
MIN	84	97	86	95	128	107	98	93	158	207	146	115
CAL YR	2010	TOTAL	127970	MEAN	351	MAX	2580	MIN	81	AC-FT	253800	
WTR YR	2011	TOTAL	88789	MEAN	243	MAX	2340	MIN	84	AC-FT	176100	

MAX DISCH: 6590 CFS AT 23:15 ON JUL 12,2011 GH 8.72 FT SHIFT 0.04 FT

MAX GH: 8.72 FT AT 23:15 ON JUL 12,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06714000 SOUTH PLATTE RIVER AT DENVER
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06717000 FALL RIVER NEAR IDAHO SPRINGS, CO.
Water Year 2011

Location.--	Lat. N39°45'20", Long. W105°33'24", Clear Creek County, CO. Gage is located on right upstream bank of the I-70 box culvert, near the Fall River Road Exit (238) approximately 20 ft. past Fall River Road.
Drainage Area and Period of Record.--	23.4 sqmi. (USGS Colorado StreamStats utility). Daily values are available from April 1, 1930 to September 30, 1938 and July 17, 2007 to present. No information available on previous gage location. Gage was reestablished by the CDWR on July 17, 2007 at present site and datum to monitor minimum streamflows and aid in water rights administration.
Equipment.--	Sutron Constant Flow Bubbler (CFB) connected to a Sutron SatLink2 Data Collection Platform (DCP) in a 12" by 30" by 36" NEMA type enclosure at on the right upstream end of a culvert conveying Fall River under I-70 to the confluence with Clear Creek. The control is a steel plate fixed to the upstream sill of the culvert. A single orifice line in 2-inch conduit extends from the enclosure terminating in a gravel packed muffler buried in the stream bed approximately 5 ft. upstream from the control. The reference is an enameled staff gage located on the right edge of water. An additional staff gage, used as backup, was located on the left edge of water wing wall but was washed away during high WY2011 flows.
Hydrologic Conditions.--	Mountainous topography mainly consisting of densely treed slopes with sporadically patches of oak shrubs and grass. Rock outcropping increases with elevation and Saint Mary's Glacier sits at the headwaters of Fall River. The river runs fast and responds quickly to rainfall-runoff events. Flow is partly regulated by several small reservoirs located upstream of the gage near St. Mary's Glacier. It should be noted that mining activity in this valley has occurred in the past.
Gage-Height Record.--	The primary record is 15-minute telemetered CFB data with logged DCP and CFB data as backup. The record is complete except for: November 10, 2010 when the stage-discharge relation was affected by ice; April 21 – 26, 2011, when the Sutron AccuBubble unit could not be successfully calibrated and April 28, 2011 when the gage pool was dug out and enlarged by a wheeled backhoe and grade control structures were placed to help slow water entering the gage pool. Instrument calibration was supported by nineteen visits to the gage this year. Three successful instrument calibrations were made this year. Two corrections of +0.05 ft. and -0.09 ft. were made following the April 28 machine work. The third was made after clearing accumulated material away from the bubbler on August 18, 2011. Instrument corrections were applied to the record as defined by events. Lack of stable surface water conditions has affected gage calibration and the accuracy of staff gage measurements. The subjective interpretation of GH level varies widely with wave bounce and is compounded with increasing stage. Changes in stage also occur rapidly and unexpectedly with changes in environmental conditions upstream of the gage. Unstable surface conditions, previously reported as bounce, are easily seen in hydrographs of 15-minute data recordings and often seen as "painting". Gage is operated seasonally. The period of record for WY2011 is October 1–November 10, 2010 and April 21–September 30, 2011.
Datum Corrections.--	Levels were run on August 10, 2010. Reference Marks 1 and 2 were established. Levels have not been run since.
Rating.--	The channel is composed primarily of gravel, cobble and small boulders. The control at all stages is a metal sill mounted in front of the box culvert running under I-70 approximately 5-feet downstream of the gage. The channel alignment is straight above and below the gage. Rating FALIDACO02, dated June 28, 2008, was used all year and is defined by measurements from 3.66 to 133 cfs. FALIDACO02 was extrapolated to 336 cfs (GH=2.70 ft) on June 14, 2010 to capture real time flows. Twelve (Nos.57-68) measurements were made this year, ranging from 5.90 to 110 cfs. Flows experienced this year were generally higher than seen in previous years of record. The peak gage height of 3.95 ft. occurred at 1900 on July 11, 2011 exceeding the definition of the rating table by 1.25 ft. The discharge for this event is not determined. The peak gage height exceeded Measurement No.64 made June 29, 2011 at 19:08 by 1.32 ft. of stage.
Discharge.--	Shifting control method was used all year. Shifts result from material moving into the stilling basin, debris accumulation in the channel and from poor definition of the rating. Cobble fills the weir basin entirely during runoff, so that the bed of the stream is level with the top of the weir. Shifts were applied by time as defined by measurements from October 1, 2010 through April 28, 2011 and August 18 through October 3, 2011. Variable shift table FALIDACOVST11-1 defined by six measurements (Nos. 59-64) made during the period of use was applied from April 28, 2011 through the peak event (July 11, 2011 19:00). Variable shift table FALIDACOVST11-2 defined by four measurements (Nos. 64-67) made during the period of use was applied from the peak event to August 19, 2011. Measurements show shifts varying between -0.73 ft. and +0.21 ft. The wide range of shifts indicates poor definition in the rating as well as changing stream profiles. All measurements were given full weight except for No. 57 which was discounted 2.29% to smooth shift distributions.
Special Computations.--	Discharge for the periods of ice effect, inability to properly calibrate the sensor and days of construction were estimated from adjacent good record, observations made to the gage during the periods and Measurement No. 58. The period from July 7-12, 2011 could not be calculated as the stage far exceeded the definition of the rating table. The period was estimated using temperature and flow trends before and after the period.
Remarks.--	The record is fair to poor. Periods of ice effect, construction and lack of rating definition are estimated and poor. Instantaneous peak discharge could not be calculated. Station maintained and record developed by Tony Arnett.
Recommendations.--	A new rating needs to be developed. Gage operation for defining higher flows should be reevaluated. Levels should be run in WY2012.

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OFFICE OF STATE ENGINEER

06717000 FALL RIVER NEAR IDAHO SPRINGS, CO.

RATING TABLE-- FALIDACO02 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

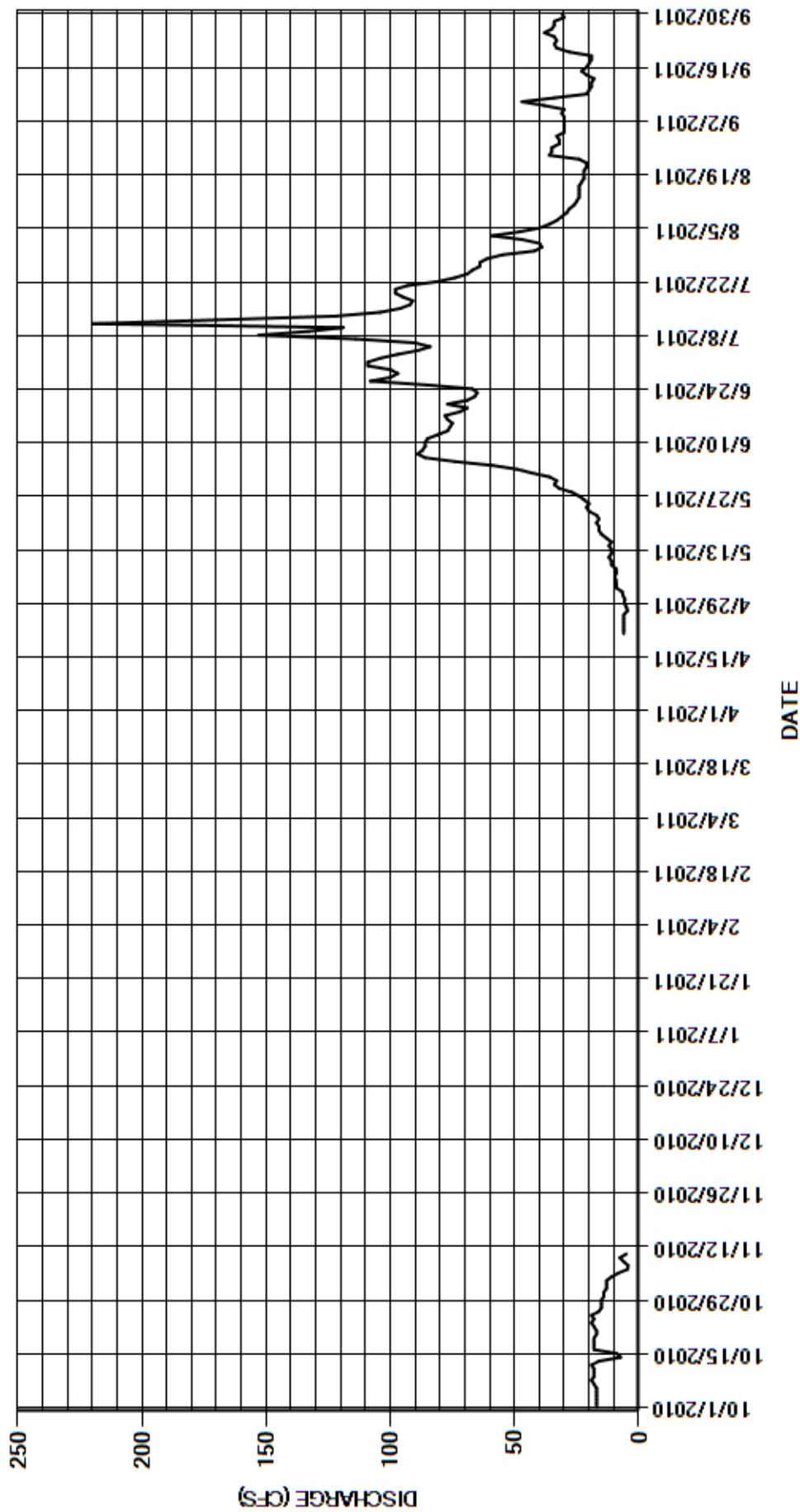
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	13	---	---	---	---	---	6.3	36	109	40	30
2	17	13	---	---	---	---	---	6.7	43	104	47	30
3	17	13	---	---	---	---	---	9.0	49	97	59	30
4	17	11	---	---	---	---	---	9.0	59	89	48	31
5	17	8.2	---	---	---	---	---	9.2	74	84	40	30
6	17	4.5	---	---	---	---	---	9.7	86	90	36	38
7	18	4.3	---	---	---	---	---	8.9	89	e114	33	47
8	19	6.1	---	---	---	---	---	9.2	87	e153	31	34
9	18	7.6	---	---	---	---	---	11	86	e133	29	21
10	18	e5.0	---	---	---	---	---	11	86	e119	28	20
11	18	---	---	---	---	---	---	12	85	e220	26	19
12	19	---	---	---	---	---	---	11	81	e170	25	19
13	16	---	---	---	---	---	---	11	77	122	24	18
14	7.3	---	---	---	---	---	---	12	76	104	24	21
15	8.8	---	---	---	---	---	---	11	75	96	24	23
16	18	---	---	---	---	---	---	13	77	92	24	21
17	18	---	---	---	---	---	---	15	78	91	23	20
18	18	---	---	---	---	---	---	16	72	95	22	19
19	18	---	---	---	---	---	---	16	69	98	22	19
20	17	---	---	---	---	---	---	17	77	98	22	28
21	17	---	---	---	---	---	e6.0	16	69	93	21	33
22	18	---	---	---	---	---	e6.0	17	66	81	21	34
23	19	---	---	---	---	---	e6.0	20	65	74	24	33
24	18	---	---	---	---	---	e6.0	21	67	69	36	34
25	19	---	---	---	---	---	e6.0	20	85	67	35	38
26	16	---	---	---	---	---	e6.0	22	108	64	35	35
27	15	---	---	---	---	---	4.5	24	100	64	32	34
28	15	---	---	---	---	---	e5.0	27	97	61	32	34
29	15	---	---	---	---	---	5.8	32	100	55	33	30
30	14	---	---	---	---	---	5.6	34	109	42	30	31
31	14	---	---	---	---	---	---	33	---	39	30	---
TOTAL	513.1	85.7	---	---	---	---	56.9	490.0	2328	2987	956	854
MEAN	16.6	8.57	---	---	---	---	5.69	15.8	77.6	96.4	30.8	28.5
AC-FT	1020	170	---	---	---	---	113	972	4620	5920	1900	1690
MAX	19	13	---	---	---	---	6.0	34	109	220	59	47
MIN	7.3	4.3	---	---	---	---	4.5	6.3	36	39	21	18
CAL YR	2010	TOTAL	7156.4	MEAN	35.4	MAX	194	MIN	4.3	AC-FT	14190	(PARTIAL YEAR RECORD)
WTR YR	2011	TOTAL	8270.7	MEAN	40.5	MAX	220	MIN	4.3	AC-FT	16400	(PARTIAL YEAR RECORD)

MAX DISCH: (NOT DETERMINED)

MAX GH: 3.95 FT AT 19:00 ON JUL 11,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06717000 FALL RIVER NEAR IDAHO SPRINGS, CO.
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06720000 CLEAR CREEK AT DERBY
Water Year 2011

Location.--	Lat 39°49'42", long 104°57'30", in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 36, T.2 S., R.68 W., Adams County, Hydrologic Unit 10190004, on right bank 875 ft downstream from York Street bridge, 0.5 mi upstream from mouth, and 2.5 mi west of Derby.
Drainage Area and Period of Record.--	575 mi ² . April-Nov. 1914, 1927 to present.
Equipment.--	Sutron Satlink DCP with digital shaft encoder and stage discharge recorder as backup in a 60 inch corrugated metal shelter and well. Primary reference is by electric tape gage (ETG). There is no outside reference. An external temperature sensor and tipping bucket rain gage is installed in the gage.
Hydrologic Conditions.--	Water is collected from the Clear Creek Drainage areas upstream and deposited ½ mile downstream into the South Platte River. Summer flows are affected by municipal and agricultural diversions upstream. In years of high snowpack, the runoff will exceed demand and much of the runoff will leave the basin past this gage. Gage also collects urban storm runoff and will see sharp peaks after rainstorms.
Gage-Height Record.--	The primary record is 15-minute data taken from the DCP with SDR log as back-up. The record is complete and reliable, except for the following periods: February 1-3, and 8-11, 2011, when the stage-discharge relationship was affected by ice. There were many periods this year where GH was affected by debris on the control. The following dates all had debris corrections that were all prorated by time from the debris correction back to point of clean control or assumed clean control: October 29 and December 3, 2010; January 26, March 3, June 6, July 27, and September 28, 2011. Corrections ranged from -0.01 ft to -0.08 ft.
Datum Corrections.--	Levels were last run to the ETG using BM 10 as base on August 25, 2011. No correction was necessary at this time.
Rating.--	The control is a rock dam formed by a pipeline crossing approximately 25 feet below the gage. Shifts are caused by changes in the channel geometry, accumulation of material on the control and possible ice affect. Rating No. 34 put in use on October 1, 1998 was used again this year. It is well defined to 1500 cfs. Nineteen measurements (Nos. 980 - 998) were made this year ranging from 4.94 to 1520 cfs. They cover the range in discharge experienced this water year except for the higher daily flows on July 8, 9, 12, 13, and 14, 2011 and the lower daily flows experienced on October 2, 22, 24, 25, and 28 - 30, 2010, also March 26, 27, 28, 30, and 31; April 7, 8, 9, 11, 12, 17, 18, and 28 - 30; May 1 - 8; August 22 and 24; September 12, 23, 24, and 29, 2011. The peak flow of 3420 cfs occurred at 0430 on July 13, 2011 at a gage height of 4.66 ft with a shift of -0.15 ft. It exceeded measurement No. 993 by 1.17 feet of stage and 1900 cfs.
Discharge.--	Shifting control method was used for the record year. Shifts were distributed by time with consideration of stage: October 1, 2010–April 19, 2011 and Sept 28 - 30, 2011. Shifts were distributed by stage using two variable stage shift relationships: April 19 thru the peak on July 13, 2011 using CLERDERCOSH11-01 based on Measurements 984-993 made during the period; July 13 thru Sept 28, 2011 using CLERDERCOSH11-02 based on Measurements 993-998 made during the period. All measurements were given full weight except Nos. 984, 985, 986, 990, and 991 were adjusted up to 6% to better fit the distribution.
Special Computations.--	Days affected by ice were estimated using adjacent good values, temperature trends, and some correlation to the PLAHENCO gage, downstream on the main stem of the South Platte River.
Remarks.--	The record is good, except for periods of ice affect, which are estimated and poor. The peak flow for the year should be considered fair as it was twice the highest measurement. Station maintained and record developed by Patrick Tyler.
Recommendations.--	A new rating is needed. An obvious stage-discharge relationship is seen each year, with varying patterns. The control is stable but needs regular cleaning to remove branches and debris. More measurements need to be made at intermediate and higher flows, especially in late Spring/early Summer when the peak normally occurs.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06720000 CLEAR CREEK AT DERBY

RATING TABLE-- CLEDERCO34 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

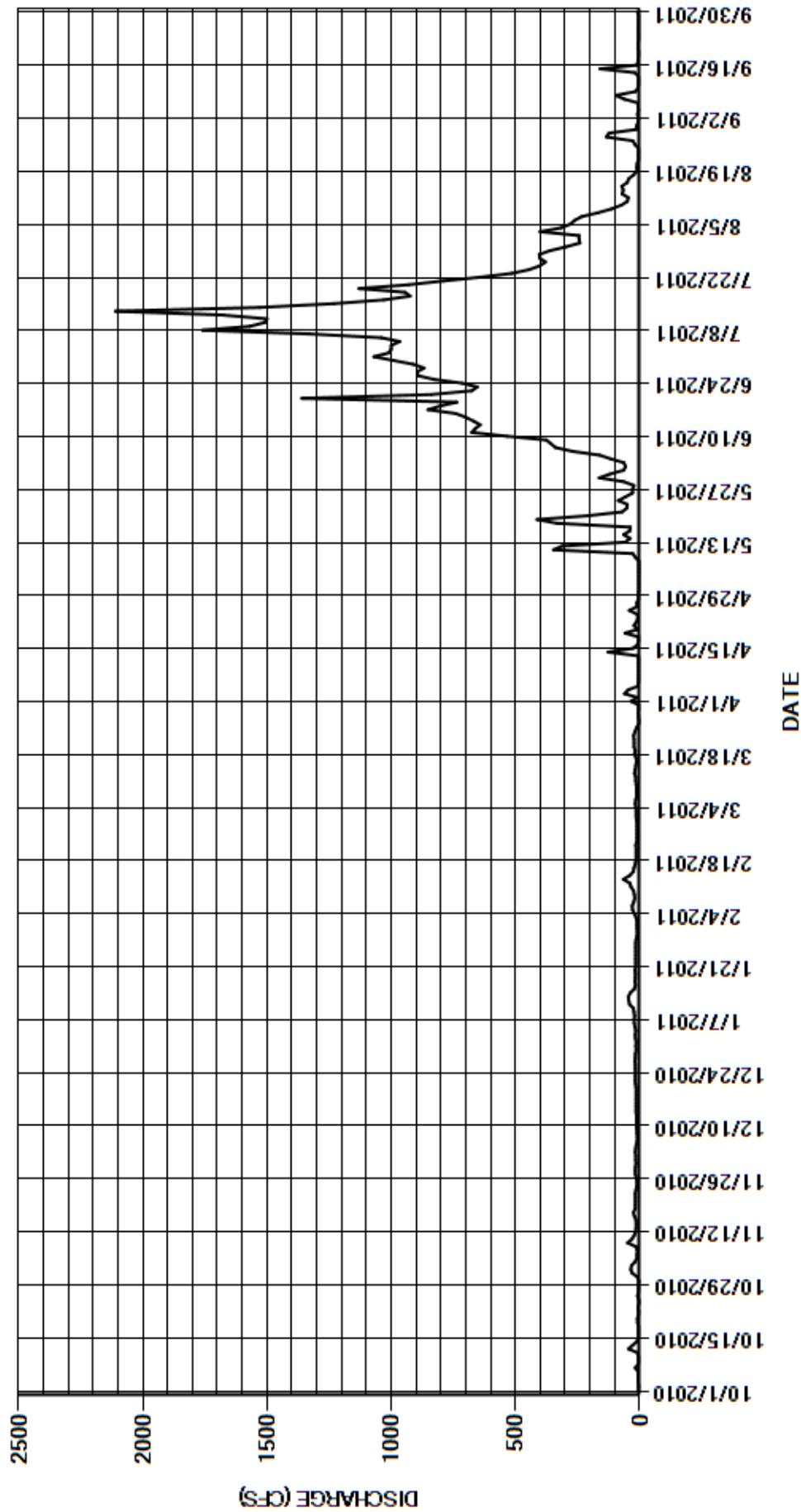
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.2	30	16	14	e11	14	35	3.6	65	1070	244	6.2
2	4.7	36	16	17	e11	14	8.5	3.6	57	1010	244	5.4
3	5.7	33	18	18	e15	14	61	4.0	64	1000	401	9.3
4	5.8	19	16	16	22	16	47	3.7	116	1000	317	5.3
5	5.7	11	14	19	29	18	6.8	3.6	161	966	279	6.1
6	6.4	11	10	22	30	16	5.5	3.4	270	1040	262	6.2
7	18	9.8	10	22	24	12	4.3	3.5	339	1330	233	62
8	5.4	15	11	21	e20	13	4.1	3.6	357	1760	168	97
9	5.0	49	12	23	e22	13	4.4	17	376	1570	114	17
10	5.3	31	12	26	e25	14	5.1	28	534	1510	74	6.2
11	8.9	22	12	41	e35	16	4.4	347	676	1500	50	5.1
12	45	16	12	44	40	16	4.2	312	662	1680	46	4.8
13	28	15	14	46	66	21	5.7	58	642	2110	71	5.4
14	11	14	15	38	40	18	127	39	669	1530	66	19
15	5.4	15	15	22	26	16	26	65	700	1230	72	160
16	5.2	21	15	17	23	13	8.3	40	741	1030	50	11
17	5.0	25	15	19	18	14	4.2	38	852	924	44	6.6
18	5.1	18	14	18	15	21	4.6	333	802	945	25	5.9
19	8.6	18	14	17	14	18	59	413	736	1130	11	5.3
20	9.2	17	15	19	14	23	7.3	209	1360	930	12	5.7
21	5.2	17	17	17	14	22	23	71	839	790	10	5.9
22	4.5	18	18	16	16	23	13	52	676	640	4.7	6.0
23	7.5	15	18	17	12	24	7.5	50	654	514	5.3	4.6
24	3.6	12	17	16	11	19	10	86	715	444	4.6	4.7
25	4.0	11	18	16	11	13	42	57	828	402	4.9	5.2
26	8.7	13	18	17	11	4.1	11	29	893	380	19	5.0
27	5.2	17	19	16	11	3.6	12	29	896	402	28	5.1
28	4.0	18	18	15	11	4.8	4.3	23	868	404	134	5.1
29	4.4	17	17	11	---	6.1	4.2	65	912	361	124	4.5
30	3.9	15	14	10	---	4.1	4.0	163	992	297	14	9.0
31	10	---	16	11	---	4.1	---	120	---	241	12	---
TOTAL	259.6	578.8	466	641	597	447.8	563.4	2673.0	18452	30140	3143.5	504.6
MEAN	8.37	19.3	15.0	20.7	21.3	14.4	18.8	86.2	615	972	101	16.8
AC-FT	515	1150	924	1270	1180	888	1120	5300	36600	59780	6240	1000
MAX	45	49	19	46	66	24	127	413	1360	2110	401	160
MIN	3.6	9.8	10	10	11	3.6	4.0	3.4	57	241	4.6	4.5
CAL YR	2010	TOTAL	37029.6	MEAN	101	MAX	1850	MIN	3.6	AC-FT	73450	
WTR YR	2011	TOTAL	58466.7	MEAN	160	MAX	2110	MIN	3.4	AC-FT	116000	

MAX DISCH: 3420 CFS AT 04:30 ON JUL 13,2011 GH 4.66 FT SHIFT -0.15 FT

MAX GH: 4.66 FT AT 04:30 ON JUL 13,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06720000 CLEAR CREEK AT DERBY
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06720500 SOUTH PLATTE RIVER AT HENDERSON
Water Year 2011

Location.--	Lat. 39° 55'20.36", Long. 104°52'7.72"(NAD83), Adams County, CO Hydrologic Unit 1019003. Gage is located on the left bank 315 ft. upstream from the 124th Ave. bridge and 0.2 miles northwest of Henderson, CO. A new gage was established at this left bank location on April 9, 2010 at the same datum as the discontinued right bank gage described below and was run concurrently with the right bank gage from April 9, 2010 to May 17, 2011 (15:15). The right bank location was discontinued at 15:15 on May 17, 2011.
Drainage Area and Period of Record.--	4,768 mi ² . May 1926 to current year. Monthly data only prior to 1933. Periodic water quality data available starting in 1955.
Equipment.--	Sutron Constant Flow Bubbler (CFB) and tipping bucket rain gage with a SatLink2 DCP in a 6 ft. by 6 ft. concrete shelter. Two orifice lines are buried in conduit to the channel. A second CFB unit is connected to the other orifice line as backup. A cantilever type wire weight gage is suspended directly over the orifice lines serving as the primary reference.
Hydrologic Conditions.--	Flows are heavily affected by transmountain diversions, numerous storage reservoirs, diversions from and deliveries to the channel as well as return flow from irrigated areas. Diversions for irrigation are estimated at about 253,000 acres. Because of the heavy regulation upstream of the gage, low flows exhibit a strong diurnal pattern from the metro effluent releases. Peak events typically are short transitory events steaming from storm events in the metro area combined with spring and summer snowmelt. The Army Corps of Engineers utilize this gage to regulate releases out of Chatfield and Cherry Creek Reservoirs to keep the flow at or below 5,000 cfs at the Henderson Gage.
Gage-Height Record.--	The primary record for all of WY11 is 15-minute satellite data with 15-minute logged DCP and 5-minute logged CFB data from the two CFB units as backup as recorded at the new left bank gage. The record is complete and reliable. One unit value, occurring on May 12, 2011 was interpolated from adjacent good record without loss of accuracy. One erroneous unit value recorded on September 30, 2011 was interpolated from adjacent good record without loss of accuracy. Instrument calibration was maintained by twenty-nine visits to the gage. Nine instrument calibration corrections ranging from +0.07 to -0.14 ft. were required this year. The larger corrections occurring between March 25 and May 13, 2011 appear to be related to either faulty instrumentation or a problem with the orifice line. The CFB unit was changed and moved to the secondary orifice line on May 13, 2011. Instrument corrections occurring between July 12 and 27, 2011 may be related to an unknown transition from static head to dynamic head as experienced at the orifice face. Instrument corrections were applied to the record as defined by visits made to the gage.
Datum Corrections.--	Levels were run on August 25, 2011 and January 26, 2012 using R.M. 10 as base. The cantilever gage was found to be 0.030 ft. high in August and 0.028 ft high in January confirming levels run on July 9, 2010. The gage was corrected to datum on January 26, 2012. The -0.03 ft correction was applied to the entire WY11 record and all measurement gage heights made in WY11 as Oct 1, 2011 is first date of official published record for the new left bank gage.
Rating.--	The control is a grouted rock dam, established in 2002 as a grade control structure by the Urban Drainage and Flood Control District. The rock dam has a low flow notch in the right of center portion of the control, and will effectively regulate flow at all stages. In March of 2010, the UDFCD sloped and revetted the left bank to resolve some bank stabilization issues. Prior to construction of the dam, the control was a shifting sand and gravel channel, with high flows being influenced by the 124th Ave. bridge opening. The channel had been scouring during the entire history of the gage. The dam effectively raised the channel bed and PZF by about 2-ft.
Discharge.--	Rating PLAHENCO34, was developed in the 2011 Water Year to account for changes pool in dynamics from the right bank location to the left bank location as well as some degree of drawdown experienced at the right bank location. It is defined by measurements from 107 to 3600 cfs. Twenty-one discharge measurements (Nos. 589-609) were made this year ranging in discharge from 107 to 3600 cfs, covering the range in stage experienced this year well, except for the higher daily flows occurring on July 13 and 14, 2011. The peak flow of 8040 cfs occurred at 0345 on July 13, 2011 at a gage-height of 10.11 ft. with a shift of 0.00 ft. The peak exceeded high flow Measurement No. 604 made the same day by 4440 cfs and 2.26 ft. of stage.
Special Computations.--	All measurements made this year were performed using half counts (20 second counts instead of 40 second counts). This method is employed to counteract the large and rapid changes in stage due to Denver-Metro Sewer releases and storm events. The measurement section changes occasionally to account for newly deposited or scoured sand. The best attempt is made to measure as close as possible to the gage as to not incur time lag in determining the measured gage-height. Many measurements have been adjusted for time lag as the GH changes rapidly. Use of weighted mean gage-height computations are necessary for large changes that occur during the measurement.
Remarks.--	The record is good except for: March 25 through May 13 and June 22 through July 27, 2011 which is fair due to some degree of sensor instability and large calibration corrections encountered during the period. The peak event is also rated as fair due to lack of definition in the rating. Station maintained and record developed by Division One staff.

Recommendations.--

Measurements throughout the range in stage experienced are required to better define the rating. Photographs of the control at various high water stages would be helpful determining the transition to channel control. Photographs taken should be labeled with the date and gage-height. Levels are recommended in the 2012 Water Year to monitor stability of the primary reference as well as newly established reference marks.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06720500 SOUTH PLATTE RIVER AT HENDERSON

RATING TABLE-- PLAHENCO34 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

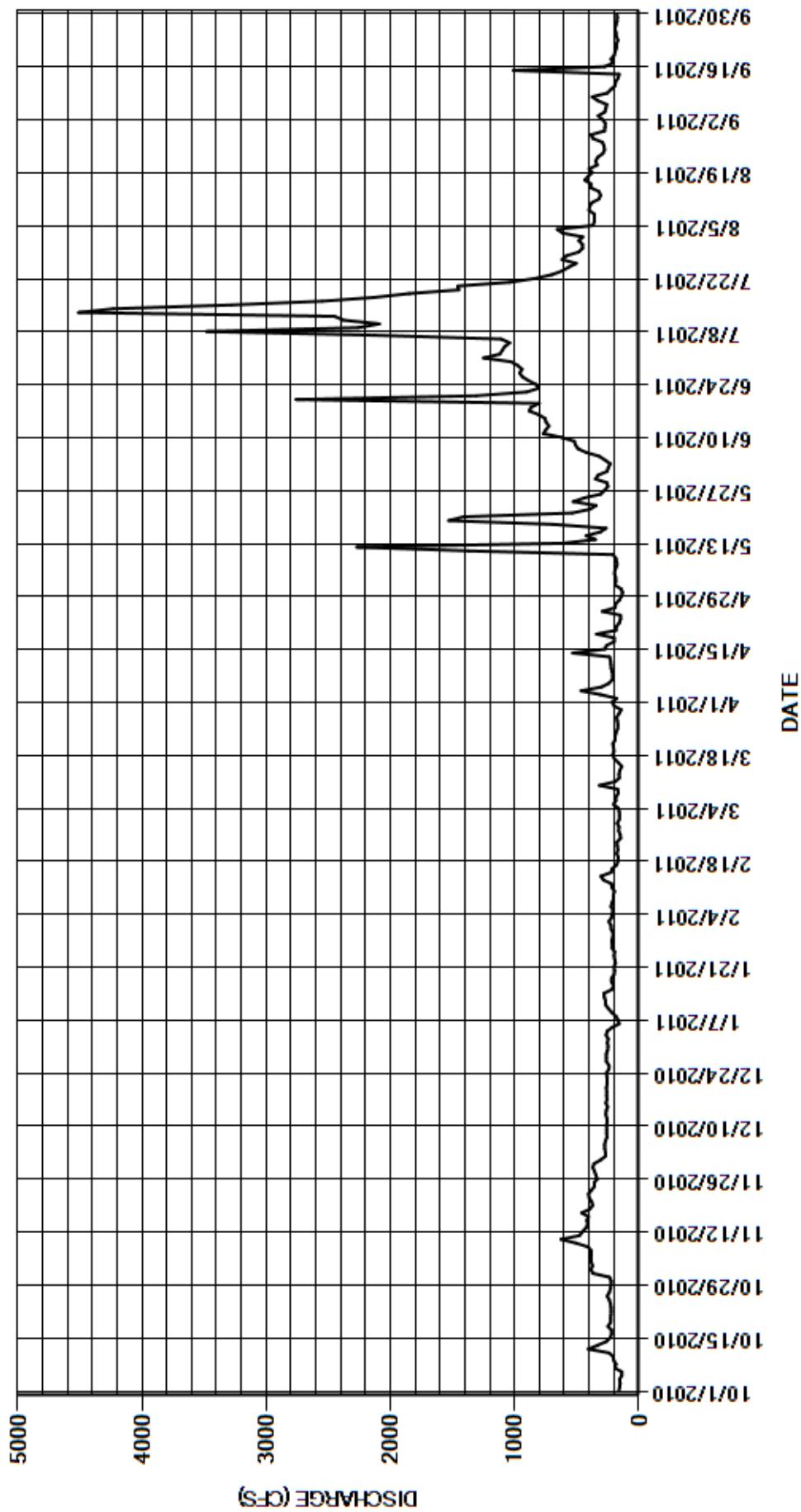
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	161	368	308	254	225	158	215	145	257	1250	483	270
2	155	386	269	247	242	157	179	194	246	1120	452	292
3	151	373	270	264	221	158	309	186	231	1100	614	328
4	156	383	275	256	216	166	466	188	272	1080	657	275
5	138	387	276	217	208	204	303	197	319	1040	371	266
6	138	382	270	159	224	186	241	192	423	1110	359	259
7	194	384	257	168	216	184	213	178	490	2130	359	330
8	184	408	259	186	203	165	210	177	510	3480	357	376
9	202	505	259	219	206	171	215	185	520	2260	402	255
10	207	627	261	246	197	317	223	206	623	2090	396	224
11	240	479	256	267	216	190	226	1370	770	2380	380	191
12	407	455	258	268	221	157	228	2270	749	2450	322	188
13	333	427	266	278	285	160	237	614	724	4510	308	167
14	262	411	263	282	306	153	533	350	747	4230	322	159
15	230	419	251	220	223	138	274	425	756	3280	388	1010
16	221	406	265	203	214	164	260	310	806	2550	386	275
17	220	460	257	219	178	196	199	264	884	2130	436	206
18	249	395	260	220	169	212	199	692	867	1850	409	224
19	229	372	259	200	166	200	340	1530	802	1450	376	199
20	227	381	262	196	178	204	184	1410	2760	1460	401	191
21	226	400	256	201	169	210	181	537	1310	1040	336	180
22	224	406	256	189	174	192	157	394	903	836	348	181
23	225	382	258	195	177	191	148	344	805	701	333	169
24	229	358	261	200	148	184	149	528	828	617	291	181
25	238	360	242	195	150	171	294	440	889	565	276	185
26	255	335	241	216	163	169	191	307	937	505	281	193
27	238	347	262	215	160	173	187	277	960	619	293	185
28	229	357	261	217	174	179	157	250	941	584	369	176
29	225	371	262	210	---	160	141	257	975	484	385	174
30	224	361	252	207	---	142	131	350	1030	453	277	177
31	237	---	248	223	---	199	---	329	---	454	273	---
TOTAL	6854	12085	8100	6837	5629	5610	6990	15096	23334	49808	11640	7486
MEAN	221	403	261	221	201	181	233	487	778	1607	375	250
AC-FT	13590	23970	16070	13560	11170	11130	13860	29940	46280	98790	23090	14850
MAX	407	627	308	282	306	317	533	2270	2760	4510	657	1010
MIN	138	335	241	159	148	138	131	145	231	453	273	159
CAL YR	2010	TOTAL	192824	MEAN	528	MAX	4160	MIN	138	AC-FT	382500	
WTR YR	2011	TOTAL	159469	MEAN	437	MAX	4510	MIN	131	AC-FT	316300	

MAX DISCH: 8040 CFS AT 03:45 ON JUL 13,2011 GH 10.08 FT SHIFT 0 FT

MAX GH: 10.08 FT AT 03:45 ON JUL 13,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06720500 SOUTH PLATTE RIVER AT HENDERSON
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
MIDDLE SAINT VRAIN AT PEACEFUL VALLEY
Water Year 2011

Location.--	Lat. N40° 07' 47"; Long W105° 31' 07" (NAD83), Boulder County, CO. Gage is located on the left bank of the Middle Fork of the Saint Vrain Creek, 1-mile west of Peaceful Valley, CO, approximately 4.6-miles above the mouth of Cave Creek and just below the USFS Camp Dick Campground.
Drainage Area and Period of Record.--	18.0 sq. mi. (USGS Colorado StreamStats utility). Daily values are available from the DWR from May 14, 1998 to present. Station established on May 14, 1998 by the Colorado Division of Water Resources (DWR). Gage is approximately 200-ft. below a site operated by the USGS from 1956 to 1958 (Middle Saint Vrain Near Raymond, CO (06722900)).
Equipment.--	Digital incremental Sutron 56-0540-400-DTR shaft encoder and temperature sensor connected to a Sutron SatLink2 Data Collection Platform (DCP) and a graphic water-stage recorder in a 42-inch corrugated metal pipe shelter and well. The stilling well is connected to the channel via three 2-inch intakes, two of which are equipped with valves and flushing equipment. The primary reference is a metal drop tape and adjustable reference point. No supplemental reference is available.
Hydrologic Conditions.--	Uninhabited forested lands of varying topography. Gage is located in the Indian Peaks Wilderness Area of Roosevelt National Forest, at the Peaceful Valley / Camp Dick campground facilities. There are no known diversion occurring upstream for the gage. Marked diurnal flow patterns occur during peak snowmelt months. Due to heavy winter conditions and the remoteness of this gage, year-round operation of the gage is not possible.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data and chart record as backup. Instrument calibration was supported by seventeen visits to the gage this year. One instrument calibration correction of -0.01 ft. was made on June 14, 2011. It was applied to the record as defined by visits to the gage. The record is complete and reliable except for: October 25 – 28, 2010 when the stage-discharge relation was affected by ice and November 6, 2010 and May 25, 2011, partial day records. Erroneous values on May 27, 2011 during dewatering of the well for installation of a new inlet were interpolated from adjacent good record without loss accuracy. Missing values occurring on July 8, 2011 were filled in with chart record without loss of accuracy. One unit value on July 29, 2011 was adjusted due to application of an erroneous instrument correction which was immediately corrected in the field. Adjustment was made without loss of accuracy. No gage-height record is available from November 7, 2010 through May 24, 2011.
Datum Corrections.--	Levels were last run on August 18, 2011 using R.M. 2 as base. The R.P. elevation was found to be within allowable tolerances. R.M. 3 and 4 were destroyed during construction of the cross-vane control structure on November 6, 2010. As such, R.M. 5 and 6 were established at the time levels were run.
Rating.--	Prior to construction of the boulder cross-vane control structure (November 6, 2010); the control was a rock riffle approximately 15-ft. below the gage. Rating MIDSTECO04, in use from October 1, 2004 was continued up to November 6, 2010. It is defined by measurements from 4.6 to 339 cfs. The control for low to moderate flows is a placed boulder cross-vane control approximately 30-ft. below the gage. The channel is straight for about 80-ft. above and below the gage. Rating MIDSTECO05, developed in the 2011 Water Year was applied to the record from May 25, 2011 through the end of the water year. It is defined by measurements from 10.4 to 341 cfs. Thirteen discharge measurements (Nos. 112-124) were made during the year, ranging in discharge from 5.99 to 341 cfs covering the range the range in stage experienced this year well. The peak flow of 426 cfs occurred at 2115 on July 8, 2012 at a gage-height of 4.25 ft with a shift of 0 ft. The peak exceeded high flow Measurement No. 119 made July 1, 2011 by 85 cfs and 0.18 ft. of stage.
Discharge.--	Shifting control method was use all year. Shifts are caused by movement of material across the gage pool. Vegetal growth and debris accumulation on the control do not appear to be an issue. Drawdown in the well had been an issue in the past but was not seen this year due to the new control. Open water measurements showed shifts varying between -0.06 to +0.01 ft., with exception of No. 115, which was not considered. Measurement Nos. 113, 116 -118, 121 and 122 were adjusted upto 3% to smooth shift distributions. Shifts were applied by time as defined by measurements.
Special Computations.--	Discharge for the ice affected period was interpolated from adjacent good record with consideration to temperature trends recorded at the gage. Partial day discharge was interpolated from adjacent good record and discharge measurements made on the day of shutdown and startup respectively.
Remarks.--	The record is good, except for the ice affected period and partial record days which are estimated and poor. This is a partial year record, no discharge record is kept in winter months. The period of record for the 2011 Water Year is October 1 through November 6, 2010 and May 25 through September 30, 2011. Station maintained and record developed by Patrick Tyler.
Recommendations.--	Efforts should be taken to better define the new rating at all stages. Levels need to be run in the 2012 Water Year to verify establishment of R.M. 5 and 6 and define the contour of the control.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

MIDDLE SAINT VRAIN AT PEACEFUL VALLEY

RATING TABLE-- MIDSTECO04 USED FROM 01-OCT-2010 TO 06-NOV-2010
MIDSTECO05 USED FROM 06-NOV-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.6	7.1	--	--	--	--	--	--	63	327	101	42
2	6.4	7.0	--	--	--	--	--	--	82	326	104	39
3	6.3	7.1	--	--	--	--	--	--	113	311	92	37
4	6.1	7.0	--	--	--	--	--	--	124	284	84	34
5	5.9	7.0	--	--	--	--	--	--	172	269	77	31
6	6.1	e7.0	--	--	--	--	--	--	229	293	70	32
7	6.1	--	--	--	--	--	--	--	256	300	65	39
8	6.9	--	--	--	--	--	--	--	237	336	60	36
9	6.7	--	--	--	--	--	--	--	252	354	54	34
10	6.6	--	--	--	--	--	--	--	243	295	52	32
11	6.4	--	--	--	--	--	--	--	230	278	49	30
12	7.4	--	--	--	--	--	--	--	216	263	48	28
13	7.3	--	--	--	--	--	--	--	216	295	48	27
14	7.0	--	--	--	--	--	--	--	225	258	48	26
15	6.6	--	--	--	--	--	--	--	228	211	49	37
16	6.2	--	--	--	--	--	--	--	233	188	52	36
17	6.0	--	--	--	--	--	--	--	247	215	50	34
18	6.4	--	--	--	--	--	--	--	250	249	47	34
19	6.9	--	--	--	--	--	--	--	238	277	43	30
20	6.7	--	--	--	--	--	--	--	256	254	42	27
21	6.4	--	--	--	--	--	--	--	236	194	43	26
22	7.6	--	--	--	--	--	--	--	245	153	44	24
23	8.3	--	--	--	--	--	--	--	272	132	45	21
24	7.6	--	--	--	--	--	--	--	294	120	43	19
25	e8.0	--	--	--	--	--	--	e35	300	120	41	19
26	e9.0	--	--	--	--	--	--	36	291	118	45	18
27	e9.0	--	--	--	--	--	--	42	276	123	45	17
28	e9.0	--	--	--	--	--	--	45	275	116	45	17
29	8.4	--	--	--	--	--	--	57	284	102	47	16
30	7.9	--	--	--	--	--	--	70	297	94	44	16
31	7.6	--	--	--	--	--	--	64	--	91	43	--
TOTAL	219.4	42.2	--	--	--	--	--	349	6880	6946	1720	858
MEAN	7.08	7.03	--	--	--	--	--	49.9	229	224	55.5	28.6
AC-FT	435	84	--	--	--	--	--	692	13650	13780	3410	1700
MAX	9.0	7.1	--	--	--	--	--	70	300	354	104	42
MIN	5.9	7.0	--	--	--	--	--	35	63	91	41	16

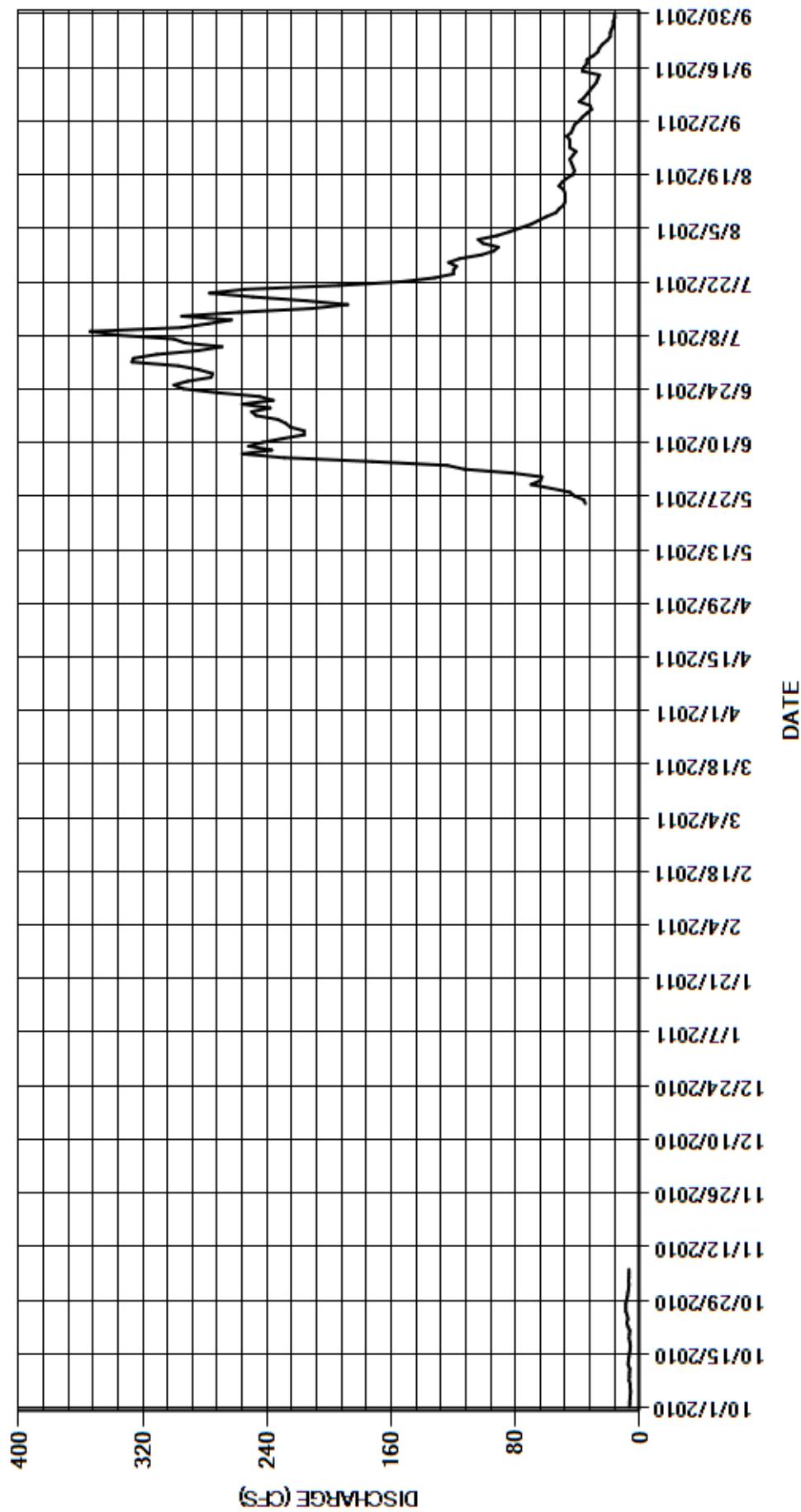
CAL YR	2010	TOTAL	10292.5	MEAN	58.5	MAX	368	MIN	5.9	AC-FT	20420 (PARTIAL YEAR RECORD)
WTR YR	2011	TOTAL	17014.6	MEAN	102	MAX	354	MIN	5.9	AC-FT	33750 (PARTIAL YEAR RECORD)

MAX DISCH: 426 CFS AT 21:15 ON JUL 08,2011 GH 4.25 FT SHIFT 0 FT

MAX GH: 4.25 FT AT 21:15 ON JUL 08,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

MIDDLE SAINT VRAIN AT PEACEFUL VALLEY
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06722500 SOUTH SAINT VRAIN NEAR WARD
Water Year 2011

Location.--	Lat. 40°05'27", Long. 105°30'53" (Google Earth) in Boulder County, 3.5 mi downstream of Brainard Lake and 1.25 miles north of Ward, Colorado.
Drainage Area and Period of Record.--	14.4 mi ² ; 1925-27, 28-31, 54-73, 1992 to present.
Equipment.--	Graphical water-stage recorder and shaft encoder connected to a Sutron Satlink II data collection platform (DCP) in a 42-inch diameter corrugated metal pipe shelter and well. The primary reference is a metal drop tape and adjustable reference point (RP) located on the equipment shelf of the shelter. No other supplemental references are available.
Hydrologic Conditions.--	Drainage area is virtually uninhabited forested lands up to the Continental Divide, with no artificial diversions. This site is commonly used for watershed studies. The gage is approximately 3.5 miles downstream from Brainard Lake, a naturally occurring water body. Water passing this gage is diverted into the Lefthand Creek basin about 1/3 mile downstream, at the Lefthand Ditch Diversion (LEFTHDCO). Normally the entire flow is diverted up to the point where it spills over the Lefthand diversion structure. So the two gages report similar, if not identical, discharges except during very high flow periods. However, the high flow point when water bypasses LEFTHDCO is not well defined. Measurements made at this gage are sometimes also used for flow at the Lefthand gage, when it is observed that 100% is being diverted.
Gage-Height Record.--	The primary record is 15-minute telemetered data with graphical chart record as backup. The record is complete and reliable, except for the following periods: October 18, 2010 when the DCP failed to transmit 1 hour of data, October 25-30, 2010 when the gage was ice affected; November 3, 2010 to May 25, 2011, when the gage was off for winter and record is not kept; May 25 - June 7, 2011, when the gage was operating but equipment was not set due to ice in the well, June 8-9, 2011 a spike in GH that cannot be explained at the downstream station (possibly something on control), June 25-July 10, 2011 when the gage was experiencing drawdown from high velocity flow past the inlets. There was one encoder correction of +0.01 ft on July 8, 2011 applied as a correction back to July 1, 2011 when all equipment readings agreed. One flush correction was applied on July 19, 2011 back to last peak in the graph 11 hours earlier.
Datum Corrections.--	Levels were run on August 18, 2011 using RM No. 1 as base. The elevation of the RP was found to be 0.015 ft. high. No correction was made.
Rating.--	The control for low to moderate flow is a rock riffle composed of embedded river boulders approximately 30 feet downstream from the gage. The high water control is a sharp bend and gradient change in the stream channel approximately 50 feet downstream of the gaging station. The control is subject to shifting boulders moving into and out of the control area as well as material embedding and being released from the rock riffle. Rating No. 11 developed in water year 2007 originally was defined by measurements from 4.74 to 156 cfs. The rating was extended in 2010 to 510 cfs to include a 2009 measurement of 317 cfs. Twelve measurements (Nos. 212-223) were performed this year ranging in discharge from 3.34 cfs to 260 cfs. They cover the range of stage experienced this water year, except for the higher mean daily flow on July 18. The peak discharge of 416 cfs occurred at 2315 July 17, 2011 at a gage height of 3.16 feet with a shift of 0.02 ft. It exceeded high flow Measurement No. 218 made on July 10, 2011 by 0.16 feet of stage. The peak gage height of 3.16 feet occurred at 2315 on July 17, 2011 as well.
Discharge.--	Shifting control method was used all year. Moss growth and debris accumulation is generally not an issue at this gage; however fill and scour conditions as well as control movement do occur. Unadjusted shifts ranged from -0.05 feet to +0.06 feet. All measurements were given full weight. All shifts were distributed by time without adjustment and heavy consideration was given to the downstream gage, LEFTHDCO, when the ditch was taking all flow. This is a partial year gage and discharges are not estimated for the winter period, November 4, 2010 to May 24, 2011. The calculated flows at LEFTHDCO are used in all estimations except the following: June 25 thru July 10, 2011 when the gage experienced drawdown and the LEFTHDCO gage was not taking all flow.
Special Computations.--	Discharges for ice affected periods were estimated using good adjacent record and the downstream station for comparison. The period of drawdown from June 25 to July 10, 2011 is estimated graphically with consideration to temperature trends.
Remarks.--	The record is good, except October 25-30, 2010 when the gage was ice affected and June 25-July 10, 2011 when the gage was in drawdown conditions. These periods are considered fully estimated and poor. November 3, 2010 and May 25, 2011 are both partial days going into and out of the shutdown period and should also be considered poor. The period from May 26-June 7, 2011, the gage was operating but equipment was not set due to ice in the well and flows are considered fair. June 8 and 9, 2011, the gage experiences an un-explained jump in GH. The flow for these two days is considered estimated and fair. Station maintained and record developed by Patrick Tyler.
Recommendations.--	Defining high flows remains a problem. High water measurements at or above 140 cfs cannot be waded. Crane measurements off the bridge at the gage are difficult and poor due to turbulence caused by a constriction at the bridge abutments, high velocities, and debris firmly lodged in the channel bed at the bridge section. Due to the remoteness of this gage, efforts to find a more suitable measurement location have been unsuccessful. Moreover, under high water conditions measurement at LEFTHDCO is not an option due to diversion practices and supercritical velocities encountered at the only available cabling location due to the LEFTHDCO structure lay out. Grooming the cabling section at this gage prior to high flow and shortening the inlets to avoid possible drawdown effects are suggested.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06722500 SOUTH SAINT VRAIN NEAR WARD

RATING TABLE-- SSVWARCO11 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

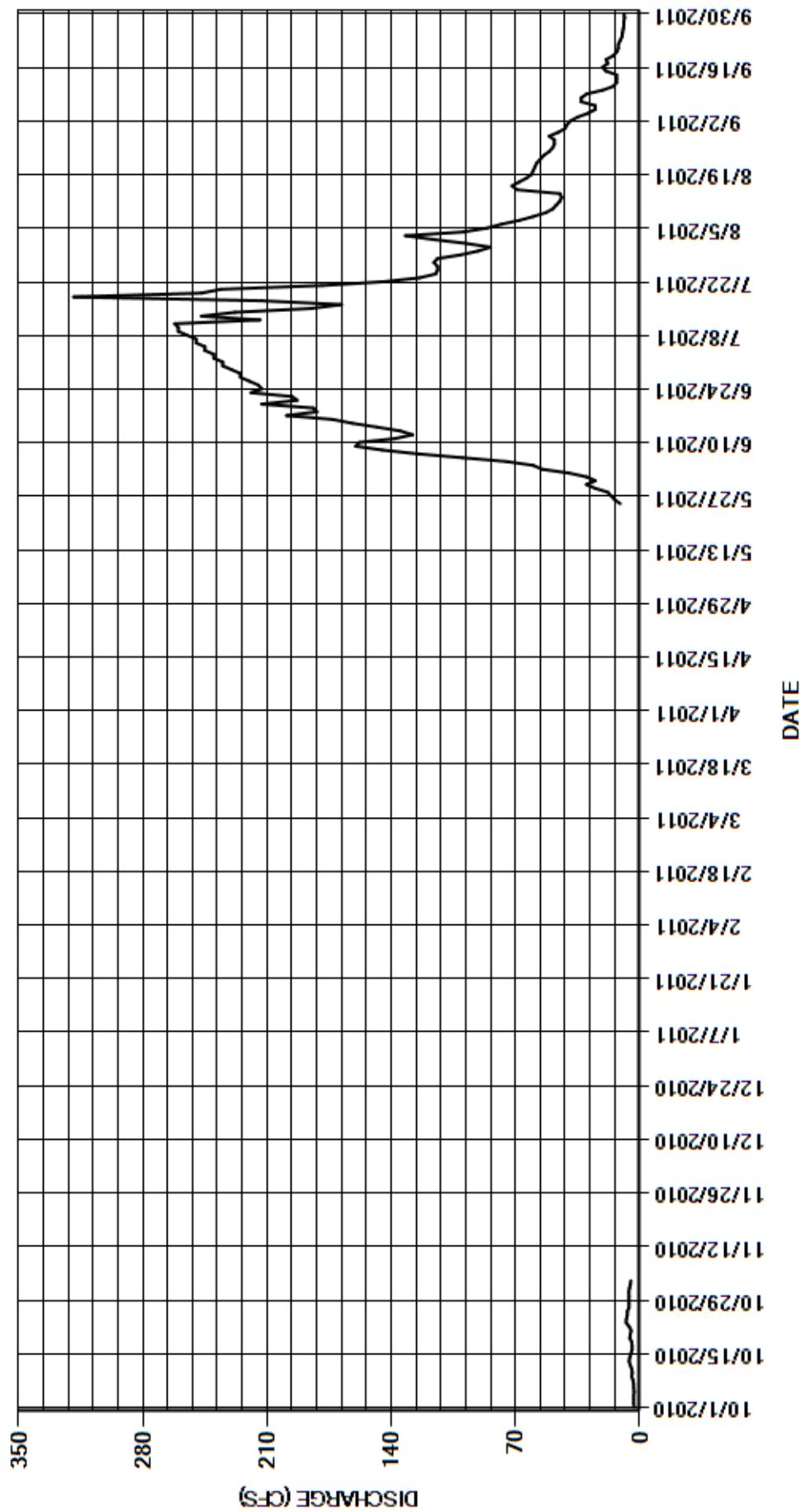
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.2	5.8	---	---	---	---	---	---	e30	e235	98	41
2	3.3	5.3	---	---	---	---	---	---	e40	e240	116	39
3	3.3	e5.0	---	---	---	---	---	---	e55	e240	132	35
4	3.3	---	---	---	---	---	---	---	e60	e245	99	29
5	3.2	---	---	---	---	---	---	---	e75	e245	86	25
6	3.3	---	---	---	---	---	---	---	e100	e250	78	25
7	3.4	---	---	---	---	---	---	---	e125	e250	68	33
8	3.8	---	---	---	---	---	---	---	e145	e255	60	33
9	4.5	---	---	---	---	---	---	---	e160	e260	53	30
10	4.2	---	---	---	---	---	---	---	158	e260	49	21
11	4.5	---	---	---	---	---	---	---	138	262	47	15
12	5.4	---	---	---	---	---	---	---	128	214	45	13
13	6.0	---	---	---	---	---	---	---	135	247	44	13
14	5.6	---	---	---	---	---	---	---	148	228	45	13
15	4.9	---	---	---	---	---	---	---	162	185	69	19
16	4.3	---	---	---	---	---	---	---	173	168	72	21
17	4.3	---	---	---	---	---	---	---	199	213	68	18
18	4.5	---	---	---	---	---	---	---	182	319	64	19
19	5.6	---	---	---	---	---	---	---	184	247	61	15
20	5.3	---	---	---	---	---	---	---	213	236	60	13
21	4.8	---	---	---	---	---	---	---	193	179	59	12
22	5.9	---	---	---	---	---	---	---	196	144	58	12
23	7.6	---	---	---	---	---	---	---	219	124	56	11
24	7.5	---	---	---	---	---	---	---	213	115	54	10
25	e7.0	---	---	---	---	---	---	e11	e215	114	51	9.7
26	e7.0	---	---	---	---	---	---	e14	e220	114	49	9.3
27	e6.0	---	---	---	---	---	---	e16	e225	116	48	8.9
28	e6.0	---	---	---	---	---	---	e18	e225	114	48	8.9
29	e6.0	---	---	---	---	---	---	e25	e230	101	51	8.6
30	e6.0	---	---	---	---	---	---	e30	e235	91	46	8.9
31	6.2	---	---	---	---	---	---	e25	---	84	42	---
TOTAL	155.9	16.1	---	---	---	---	---	139	4781	6095	1976	569.3
MEAN	5.03	5.37	---	---	---	---	---	19.9	159	197	63.7	19.0
AC-FT	309	32	---	---	---	---	---	276	9480	12090	3920	1130
MAX	7.6	5.8	---	---	---	---	---	30	235	319	132	41
MIN	3.2	5.0	---	---	---	---	---	11	30	84	42	8.6
CAL YR	2010	TOTAL	8206.0	MEAN	48.6	MAX	266	MIN	3.2	AC-FT	16280	(PARTIAL YEAR RECORD)
WTR YR	2011	TOTAL	13732.3	MEAN	84.2	MAX	319	MIN	3.2	AC-FT	27240	(PARTIAL YEAR RECORD)

MAX DISCH: 416 CFS AT 23:15 ON JUL 17,2011 GH 3.16 FT SHIFT 0.02 FT

MAX GH: 3.16 FT AT 23:15 ON JUL 17,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06722500 SOUTH SAINT VRAIN NEAR WARD
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
LEFT HAND DIVERSION NEAR WARD
Water Year 2011

Location.--	Lat. 40°05'29", Long. 105°30'31"(Google Earth), In Boulder County, CO. The gage is located ½ mile downstream from gage on S. St. Vrain Creek off Highway 72.
Drainage Area and Period of Record.--	Established station on May 21, 1992 at request of Water Commissioner for administration of water rights in District 5, Div. 1. The gage is located 0.4 miles downstream from gage on South Saint Vrain Creek off Highway 72. This station is operated as a partial year record station usually from May to October.
Equipment.--	Graphical water-stage recorder, Sutron shaft encoder and a Sutron Satlink II data collection platform (DCP) in a 36-inch diameter corrugated metal pipe shelter and 42-inch concrete well. The well is connected to the channel with two two-inch polyvinyl conduit (PVC) inlets. The PVC inlets are equipped with ball valves, street keys and flushing risers. The primary reference is a metal drop tape and adjustable reference point (RP) located on the equipment shelf of the shelter. No other supplemental references are available.
Hydrologic Conditions.--	Semi-regulated diversion point. This gage measures water diverted from the South Saint Vrain Creek into James Creek and thence to Lefthand Creek in the Boulder Creek watershed. Diversions usually encompass the entire flow of the South Saint Vrain Creek at this point. The drainage area listed for the upstream gage, South Saint Vrain Near Ward, CO (SSVWARCO) is 14.3 sq mi consisting of virtually uninhabited forested lands. The SSVWARCO gage is approximately 3.5 miles below Brainard Lake and approximately 0.4 miles above the Left Hand Diversion at South Saint Vrain Creek (LEFTHDCO) gage. The LEFTHDCO diversion structure is comprised of a concrete diversion dam, and a 10-foot wide radial gate with trash rack located approximately 55-feet upstream from the control. The radial gate is operated in such a way that it is under pressure for a majority of the season creating a somewhat regulated diversion. Due to this operational regime, peaks and troughs encountered by the SSVWARCO gage can be somewhat attenuated at this gage. Some inflow is expected to occur between the SSVWARCO and LEFTHDCO gage during runoff and storm events which accounts for some computational differences. Travel time between gages is approximately 10 to 20 min(depending on velocity), therefore minimal time lag effect.
Gage-Height Record.--	The primary record is 15-minute telemetered data with graphical chart record and DCP log as backup. The record is complete and reliable, except for the following periods: October 25 - 30, 2010 when the gage was ice affected; November 4, 2010 thru May 24, 2011, when the gage was off for winter season. The DCP failed to transmit values several times this year which were filled in using backup data. October 8 - 14, 2010, November 2 and 3, 2010, and July 3 and 4, 2011, were all filled in using the log backup without loss in accuracy. July 4 - 8, 2011 was filled in using chart backup, accuracy intact. October 14 - 18, 2010 (encoder set incorrectly), also filled in with chart backup and no loss in accuracy. Two encoder corrections were applied to the record this year on July 29 and August 11, 2011 back to the point of last equipment agreement. A -0.04 ft. correction was applied on October 4, 2010 back to October 1, 2010 to account for a debris collection on the control.
Datum Corrections.--	Levels were last run on August 18, 2011. The RP elevation was found to be 0.022 ft. high. No correction was made. In the past levels have been run using RM #1 as a starting point. Due to concrete deterioration, Left Hand Ditch Company has been repairing portions of the wingwalls. RM #1, has been disturbed and/or destroyed as the starting point. No correction was made so that the difference can be verified in the next levels run. Point of zero flow (PZF) was last verified on September 24, 2005 and determined to occur at a gage-height of 0.86 feet.
Rating.--	The control is a broad crested concrete dam approximately 10 feet below the gage shelter. Rating No. 3 in use since October 2005 was used again this water year. It was extended in Water Year 2009 to include Measurement 143, the highest measurement recorded at this gage. Flows above approximately 90 cfs cannot be measured at the gage, therefore high water measurements must be made upstream at SSVWARCO and applied to LEFTHDCO. Previously Rating No 3 had been extended to 296 cfs based on a high measurement of 156 cfs made in 2006. However, the new high measurement of 316 cfs (No. 143 made June 27, 2009) had a very high shift (+0.37), indicating that the previous extension may not have been accurate. A new rating may be in order if Msmt. No 143 is validated in the future by a similar high flow measurement with a reliable GH. This year flows were again similar to that of last year, however when the peak measurement was made at SSVWARCO, the diversion was not taking all the river and both the diversion and natural channel were both flowing too quickly to measure. Eleven measurements (Nos. 158-168) were made this year ranging in discharge from 3.62 to 170 cfs. They cover the range experienced for this water year. Measurement Nos. 161 to 165 (when flow rates were above wadeable limits at LEFTHDCO) were made at the SSVWARCO gage and applied to this gage. Measurement Nos. 161, 162, and 165 applied from SSVWARCO were done when LEFTHDCO was diverting the entire flow and confirmed by field observation. Measurement Nos. 163 and 164 had flows that were high enough to bypass the gage and flow into the natural channel of the South Saint Vrain. For these two measurements, the natural channel was measured and subtracted from the total at SSVWARCO. The peak flow of 218 cfs occurred at 0430 on June 20, 2011 at a gage height of 2.31 ft with a shift of +0.09 ft. It exceeded measurement 164, made June 24, by 0.11 ft in stage.
Discharge.--	Shifting control method was used all year. Moss and debris accumulation is generally not an issue at this gage however; larger debris such as tree limbs can catch on the control. Velocities are high past the gage and inlet drawdown has been speculated as a source of GH irregularity and consequent shifts. SSVWARCO and LEFTHDCO are in such close proximity to each other that discharges should be quite consistent. Shifts were applied by time with consideration of stage for the entire period of good ice free record. Measurements showed shifts ranging from -0.03 ft to +0.12 ft. All measurements were given full weight. The peak flow period was well defined by 5 measurements (Nos. 161-165) made during June 7 - July 29. While stage shifting is not obvious this year, a certain degree of drawdown is present and has affected shifts. The shifts have been applied as found in order to adjust for the drawdown.

Special Computations.-- Discharge was estimated during periods of ice effect, using upstream gage (SSVWARCO), adjacent good record, partial record, and temperature trends. A comparison spreadsheet has been prepared and is included in the record to confirm the flow relationships between the upstream and downstream gages. This is a partial year record with no record for November 4, 2010 through May 24, 2011. However, diversion continues through the winter and winter figures are estimated in water commissioner records.

Remarks.-- The record is good, except for periods of ice effect (October 25 - 30, 2010) and November 3, 2010 and May 25, 2011 which were partial record days, which are estimated and poor. Station maintained and record developed by Patrick Tyler.

Recommendations.-- High flow measurements are difficult and dangerous to perform at this gage as well as the SSVWARCO gage and are often poor. Due to the remoteness of these gages, other locations for performing high water measurements are not possible. If a bank operated cableway were installed at the SSVWARCO gage, some resolution of these issues may occur. That said, another measurement in the 200-300 cfs range would be very helpful in building a new rating. Such a measurement would need to incorporate observations about gate operation and GH reliability. A staff on the gate pool might help.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

LEFT HAND DIVERSION NEAR WARD

RATING TABLE-- LEFTHDCO03 USED FROM 01-OCT-2010 TO 30-SEP-2011

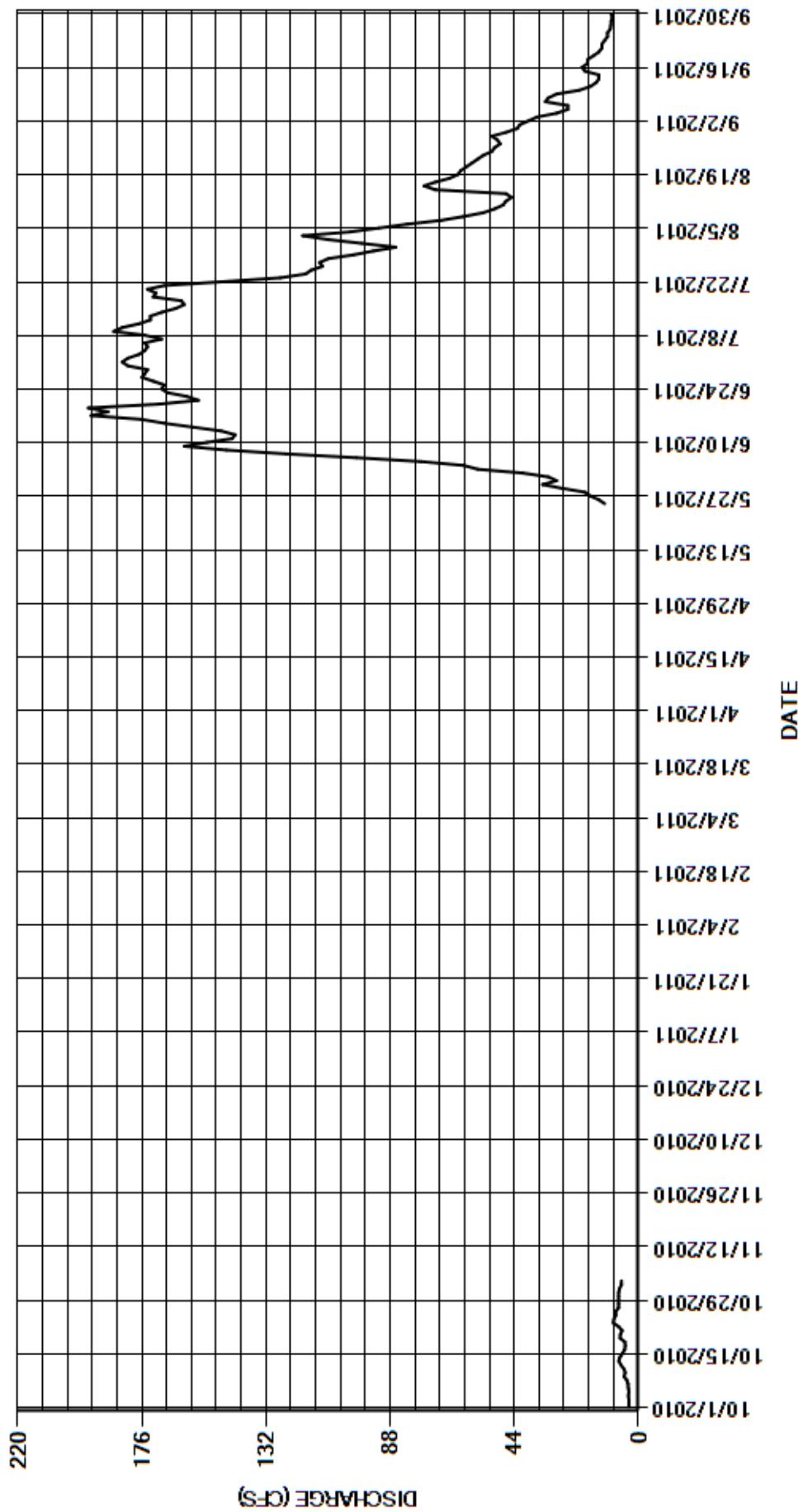
DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011												
DAY	MEAN VALUES											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.4	6.7	---	---	---	---	---	---	32	183	98	42
2	3.4	6.0	---	---	---	---	---	---	41	181	110	39
3	3.4	e6.0	---	---	---	---	---	---	57	177	119	36
4	3.6	---	---	---	---	---	---	---	62	175	102	29
5	3.4	---	---	---	---	---	---	---	77	174	92	25
6	3.6	---	---	---	---	---	---	---	100	175	82	25
7	3.7	---	---	---	---	---	---	---	125	169	70	33
8	4.1	---	---	---	---	---	---	---	146	175	62	32
9	5.1	---	---	---	---	---	---	---	161	186	55	29
10	4.7	---	---	---	---	---	---	---	153	183	51	21
11	5.2	---	---	---	---	---	---	---	144	177	48	17
12	6.2	---	---	---	---	---	---	---	143	173	47	15
13	7.0	---	---	---	---	---	---	---	148	173	45	14
14	6.6	---	---	---	---	---	---	---	158	169	47	14
15	5.7	---	---	---	---	---	---	---	168	164	72	19
16	4.9	---	---	---	---	---	---	---	176	161	76	20
17	4.7	---	---	---	---	---	---	---	194	162	72	18
18	4.8	---	---	---	---	---	---	---	188	172	67	18
19	6.5	---	---	---	---	---	---	---	195	171	64	16
20	6.4	---	---	---	---	---	---	---	170	174	63	14
21	5.8	---	---	---	---	---	---	---	156	168	61	13
22	7.0	---	---	---	---	---	---	---	160	147	59	13
23	8.9	---	---	---	---	---	---	---	167	127	57	12
24	8.7	---	---	---	---	---	---	---	169	118	55	11
25	e8.0	---	---	---	---	---	---	e12	168	116	52	11
26	e8.0	---	---	---	---	---	---	14	172	112	51	10
27	e7.0	---	---	---	---	---	---	17	176	113	49	9.8
28	e7.0	---	---	---	---	---	---	19	175	110	50	9.7
29	e7.0	---	---	---	---	---	---	27	174	101	52	9.3
30	e7.0	---	---	---	---	---	---	34	181	94	47	9.7
31	7.0	---	---	---	---	---	---	29	---	86	43	---
TOTAL	177.8	18.7	---	---	---	---	---	152	4336	4766	2018	584.5
MEAN	5.74	6.23	---	---	---	---	---	21.7	145	154	65.1	19.5
AC-FT	353	37	---	---	---	---	---	301	8600	9450	4000	1160
MAX	8.9	6.7	---	---	---	---	---	34	195	186	119	42
MIN	3.4	6.0	---	---	---	---	---	12	32	86	43	9.3
CAL YR	2010	TOTAL	7387.4	MEAN	43.7	MAX	167	MIN	3.4	AC-FT	14650	(PARTIAL YEAR RECORD)
WTR YR	2011	TOTAL	12053.0	MEAN	73.9	MAX	195	MIN	3.4	AC-FT	23910	(PARTIAL YEAR RECORD)

MAX DISCH: 218 CFS AT 04:30 ON JUN 20,2011 GH 2.31 FT SHIFT 0.09 FT

MAX GH: 2.31 FT AT 04:30 ON JUN 20,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LEFT HAND DIVERSION NEAR WARD
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06724000 SAINT VRAIN CREEK AT LYONS, CO
Water Year 2011

Location.--	Lat. 40°13'13.27"; Long. 105°15'45.36" (NAD83), in Boulder County, CO, Hydrologic Unit 10190005. Gage is on the left bank 75 ft southwest of U.S. Highway 36 (State Highways 7 and 66) at southeast edge of Lyons, 400 ft upstream from St. Vrain Supply Canal, and 0.4 mi downstream from confluence of North and South St. Vrain Creeks.
Drainage Area and Period of Record.--	216 mi ² (USGS Colorado StreamStats utility). Aug. 1887 to Sep. 1891, June 1895 to current year. Monthly only data for some periods. Water quality data available from Oct. 1977 to Feb. 1981. On March 23, 2003, the gage was moved approximately 0.2 mi upstream. In the new location, the gage is above the Supply Ditch diversion, whereas the old location was below this diversion.
Equipment.--	Digital incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink2 Data Collection Platform (DCP) and a Steven's graphic water-stage recorder in a 6-foot by 6-foot exposed aggregate precast concrete building overtop a 42-inch precast concrete stilling well upstream of a low head concrete diversion dam. An Electric Tape Gage (ETG) located on the instrument shelf is the primary reference with a supplementary cantilever chain gage located 10 feet downstream of the shelter. The stilling well is connected to the channel via four 2-inch inlets, three of which are equipped with valves and flushing equipment. A bank operated cableway is located 15 ft downstream from the shelter, A secondary shaft encoder is installed on the instrument shelf of the shelter. This shaft encoder is used for the Highland Ditch Company's Supervisory Control and Data Acquisition (SCADA) system. This instrument is maintained by the Colorado Division of Water Resources (CDWR) and operated such that the instruments stage reading is set to the base gage stage plus or minus the last measured shift.
Hydrologic Conditions.--	Drainage area mainly comprised of forested and grassy areas with varying topography. Gage is located below the confluence of the south and north forks of the Saint Vrain and below most of Lyons Colorado. Beaver Creek and Button Rock Reservoirs are upstream of this gage as well as numerous other diversions of varying magnitude. This station is susceptible to rapid increases in stage due to storm runoff events from hardened surfaces within the Town of Lyons, CO.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data and chart record as backup. Instrument calibration was maintained by twenty-six visits to the gage this year. Two instrument corrections of -0.01 ft. were made on November 3, 2010 and September 26, 2011 and were applied to the record as defined by visits to the gage. One flush correction of +0.05 ft. was made on April 27, 2011. Removal of accumulated debris on the diversion dam caused a correction of -0.05 ft. on November 3, 2010. The record is complete and reliable except for: November 24-25, 30, 2010 and December 12, 17-19, 25-29, 2010 when the stage-discharge relation was affected by ice; December 30 and 31, 2010 through January 3, 2011 when the stilling well was frozen; January 4 through March 21, 2011 when the gage was winterized; March 22, 2011 partial day record and June 16 through July 11, 2011 when draw-down conditions were identified.
Datum Corrections.--	Levels were last run to the inside gage on September 9, 2010 using R.M. No. 2 as base. The ET gage elevation was found to be within the allowable limits. As such, no correction was required.
Rating.--	The control for low to mid level stages is a low-head concrete diversion dam for the Supply Ditch approximately 570 feet below the gage. At higher stages the gage reverts to channel control; which, has not been fully defined since the gage relocation in 2003. The diversion dam and ditch check structure approximately 1000 feet below the gage can gather debris and cause backwater conditions at the gage under certain operational circumstances. Rating No. 26 in use since October 1, 2009 is defined by measurements from 13.6 to 1230 cfs. Eighteen measurements (Nos. 599-616) were performed this water year ranging in discharge from 13.6 to 973 cfs covering the range in stage experienced this year well. Measurement Nos. 608 and 610 are suspected of being artificially high due to skewed velocities caused by use of a 50# sounding weight, indicated for use due to shallower depths, but required use of a 75# weight because of high velocities. The peak discharge of 1140 cfs occurred at 0400 July 9, 2011 at a gage height of 3.57 ft with a shift of +0.03 ft. The peak exceeded high flow Measurement No. 612 by 67 cfs and 0.16 ft. in stage.
Discharge.--	Shifting control method was use for all periods of open water. Shifts are caused by fill and scour of the gage pool as well as debris accumulation on the low water control. Shifts were mainly applied by time as defined by measurements. Stage dependant shifting using variable shift table SVCLYOCOVST11-1 was applied from April 27, 2011 through the peak of July 9, 2011. It is defined by eight measurements (Nos. 606-613) made during the period of use. SVCLYOCOVST11-2, defined by three measurements (Nos. 613-615) made during the period of use was applied from the peak through August 22, 2011. Open water measurements showed shifts varying between -0.03 and +0.06 ft. All were given full weight except for Nos. 599, 607, 608, 610, 613 and 614 which were discounted from -3.45% to 5.95%, (Nos. 610 and 608 discussed above).
Special Computations.--	Discharge for the ice affected record as well as the winter period was estimated from adjacent good record, logged temperature trends and 4 measurements (Nos. 602-605) made during the period. The well experienced drawdown conditions from June 16 - July 11, 2011. The drawdown corrections have been hand-calculated back to the suspected start point. Flows have then been estimated based on those calculations. No estimation in this drawdown period exceeds more than a 6% change from the original calculated discharge.
Remarks.--	The record is good except for periods of ice effect, frozen inlets, winter record and partial day record which are estimated and poor and the drawdown period, including the peak event which is fair. Station maintained by Russell Stroud and record developed by Patrick Tyler and Russell Stroud.

Recommendations.--

Special care needs to be taken when performing Bank Operated Cableway (BOC) measurements. BOC measurements are often difficult to sound correctly and may introduce error into the measurement. Depths at the BOC are many times insufficient for two point (.2/.8) method incurring further error. Control and diversion check structure should be monitored for accumulated debris that may cause backwatering conditions. Levels need to run in the 2012 water year to monitor any subsequent settling of the new shelter. The addition of one to two additional reference marks is highly recommended.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06724000 SAINT VRAIN CREEK AT LYONS, CO

RATING TABLE-- SVCLYOCO26 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

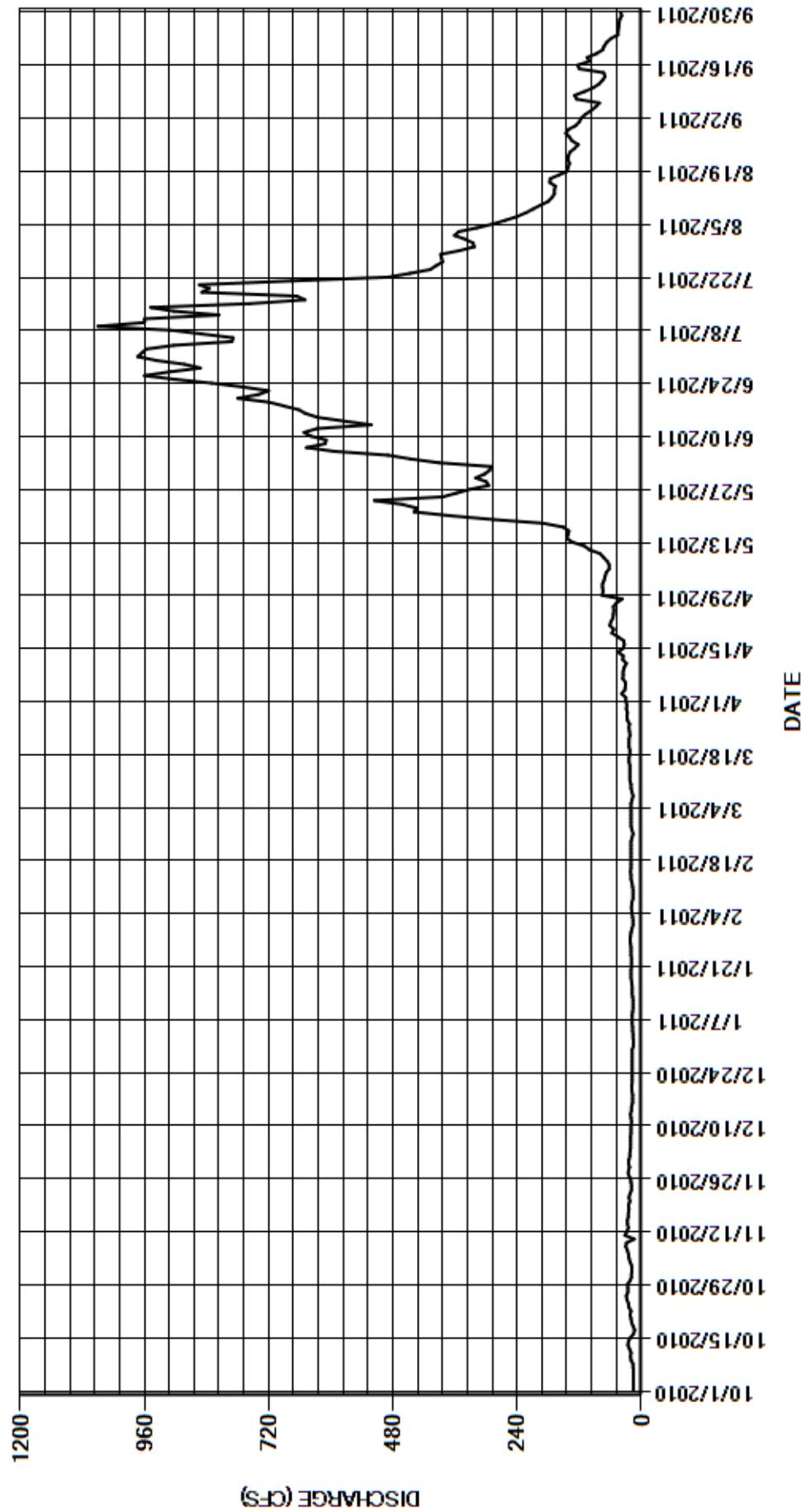
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	19	24	e15	e16	e20	30	75	293	973	340	120
2	15	18	22	e16	e16	e20	30	75	291	965	361	116
3	15	19	22	e16	e17	e20	38	72	392	957	353	108
4	15	22	21	e17	e18	e20	32	70	446	903	318	97
5	15	24	21	e17	e19	e20	31	68	490	791	288	88
6	15	25	21	e18	e19	e18	31	62	593	789	263	81
7	16	27	21	e18	e18	e16	36	62	647	e850	240	125
8	16	30	20	e18	e16	e18	35	66	611	e910	223	129
9	20	29	20	e17	e16	e20	35	73	609	e1050	209	110
10	21	14	20	e16	e16	e20	33	80	638	e960	195	93
11	20	32	19	e16	e17	e22	29	100	652	e960	180	82
12	23	28	e20	e16	e18	e22	36	110	627	816	173	75
13	26	25	21	e17	e20	e22	35	133	522	903	168	70
14	25	27	19	e18	e20	e22	45	144	575	948	168	73
15	21	27	19	e18	e21	e22	35	142	626	756	166	120
16	15	25	17	e18	e20	e24	33	140	649	650	177	123
17	13	25	e17	e19	e20	e24	34	151	662	666	176	100
18	16	24	e17	e20	e20	e22	45	189	691	849	159	105
19	19	25	e18	e20	e20	e22	57	286	e720	835	143	87
20	20	22	19	e20	e20	e24	53	369	e780	854	142	75
21	22	24	18	e19	e20	e24	61	439	e740	676	139	72
22	20	22	18	e19	e20	e24	59	434	e720	489	142	67
23	24	19	18	e19	e20	22	55	462	e770	447	141	59
24	25	e19	18	e20	e18	23	54	516	e830	408	138	45
25	28	e20	e18	e20	e16	24	53	383	e900	397	129	45
26	29	21	e18	e20	e18	23	54	357	e960	384	122	44
27	26	25	e18	e21	e20	27	48	330	911	386	134	43
28	26	25	e18	e22	e20	28	37	295	852	388	139	42
29	27	23	e18	e21	---	27	76	300	883	352	146	38
30	22	e25	e18	e20	---	29	74	320	937	323	141	40
31	19	---	e15	e18	---	28	---	303	---	325	127	---
TOTAL	629	710	593	569	519	697	1304	6606	20017	21960	5940	2472
MEAN	20.3	23.7	19.1	18.4	18.5	22.5	43.5	213	667	708	192	82.4
AC-FT	1250	1410	1180	1130	1030	1380	2590	13100	39700	43560	11780	4900
MAX	29	32	24	22	21	29	76	516	960	1050	361	129
MIN	13	14	15	15	16	16	29	62	291	323	122	38
CAL YR	2010	TOTAL	47153	MEAN	129	MAX	1210	MIN	13	AC-FT	93530	
WTR YR	2011	TOTAL	62016	MEAN	170	MAX	1050	MIN	13	AC-FT	123000	

MAX DISCH: 1140 CFS AT 04:00 ON JUL 09,2011 GH 3.57 FT SHIFT 0.03 FT

MAX GH: 3.57 FT AT 04:00 ON JUL 09,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06724000 SAINT VRAIN CREEK AT LYONS, CO
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06727000 BOULDER CREEK NEAR ORODELL
Water Year 2011

Location.--	Lat. N. $40^{\circ}0'23.5''$; Long. W. $105^{\circ}19'49.8''$ (NAD83) Boulder County, CO, Hydrologic Unit 10190005. Gage is on the left bank of Boulder Creek 0.3 miles downstream from the City of Boulder's Boulder Canyon Hydroelectric Facility and 1.1 miles upstream from Fourmile Creek, or 8.5 miles east of Barker Reservoir and 2.6 miles west of the Boulder Public Library which is adjacent to the Boulder Creek at Boulder, CO (BOCOBOCO) stream gage.
Drainage Area and Period of Record.--	102 mi ² (USGS Colorado StreamStats utility). Daily values are available from October 1, 1906 to November 30, 1915 and March 1, 1916 to present.
Equipment.--	Digital incremental Sutron 56-0540-400-DTR shaft encoder and a temperature sensor connected to a Sutron SatLink2 Data Collection Platform (DCP) and a standalone Sutron SDR-0001-1 in a 6-ft by 6-ft. precast concrete shelter sitting overtop a 54-inch corrugated metal pipe stilling well. The well is connected to the stream via three 2-inch intakes equipped with flushing provisions. An electric tape gage on the instrument shelf is the primary reference with a supplemental staff gage located on the opposite side of the channel, behind the shelter. The gage has AC power to keep the well and intakes open in winter months. OneRain Inc. operates and maintains a pressure transducer connected to an early warning radio under contract with the City of Boulder.
Hydrologic Conditions.--	Flows are regulated by operations of Barker Reservoir and diversions from Barker Reservoir. Water diverted for power generation at the Boulder Canyon Hydroelectric Facility is returned a few hundred feet above the gage. Hydroelectric operations can cause rapid changes in gage-height. Power generation activities in winter months help keep the channel at the gage open.
Gage-Height Record.--	The primary record is 15-minute satellite data with SDR and DCP log as backup. The record is complete and reliable, except for: November 9, 2010 during construction activities, December 16, 2010 to January 25, 2011 and January 31 to February 13, 2011, when the stage-discharge relation was affected by ice. The DCP failed to log data on the following days: November 18 - 23, 2010, January 28, April 14, and July 21, 2011. All values were filled in using the SDR log as backup without loss of accuracy. Instrument calibration was supported by 25 visits to the gage this year. Several instrument calibration corrections of ± 0.01 ft. were made this year and all were prorated back to last point of gage agreement. One debris correction of -0.02 ft. occurred on November 12, 2010 and was prorated back to last visit. The tape adjustment made on October 28, 2010, the result of running levels, required an instrument correction. The tape correction was not applied to the gage, however, it can be seen in the measurement shifts. The encoder experienced failure on July 31, 2011 where it was reset to 0.00 ft. The encoder continued to function correctly after the failure so a 2.82 ft. correction was applied through the affected period. The stilling pool was cleaned out on November 9, 2010. Large amounts of cobble were removed from the pool and tucked into the bank. Care was taken not to affect the control; however the material on the bank may have adjusted the upper end of the rating by tightening the banks.
Datum Corrections.--	Levels were last run on August 17, 2011. Results verified levels and tape adjustment made during the levels run on October 28, 2010. The tape length was adjusted to 11.317 ft. on Oct 28 2010.
Rating.--	The control for low to mid level flows is a cobble and boulder riffle approximately 60 ft. below the gage. Channel control at higher stages. Rating BOCOROCO14, in use since October 1, 2004, was continued in use for all of WY2011. It is defined by measurement to 757 cfs. Nineteen discharge measurements (507 - 525) were made this year ranging in discharge from 12.7 to 751 cfs covering the range in stage experienced this year well except for the higher daily flows of July 9-11 and 13, 2011. The peak flow of 1030 cfs occurred at 0015 July 13, 2011 at a gage-height of 3.81 ft. with a shift of -0.16 ft. The peak exceeded high flow Measurement No. 519 made July 10, 2011 by 279 cfs and 0.19 ft of stage.
Discharge.--	Shifting control method was used all year. Shifts are caused by fill and scour of materials through the gage pool and movement of the control at higher flows. Shifts were prorated by time as defined by measurements from October 1, 2010 to March 4, 2011. Variable shift table BOCOROCOVST11-1, defined by thirteen discharge measurements (Nos. 512-526) made during the period of use was applied from March 4 through the end of the water year. Open water measurements showed shifts varying between -0.16 and +0.02 ft. All were given full weight except for Nos. 508, 509, 515, 518, 524 and 525 which were discounted up to $\pm 7\%$ to smooth shift distributions. Measurement Nos. 517 and 522 were not considered in the development of this record due to doubts in their accuracy. Both measurements were made under difficult measurement circumstances.
Special Computations.--	Discharge for the ice affected periods was estimated from adjacent good record, temperature trends and a mass balance calculation using discharges recorded at the BOCOBODO gage and the Water Commissioner's account of diversions away from the creek during the period. A mass balance spreadsheet is used for winter estimation. However, the Fourmile Creek gage (operated by the USGS) is only operated seasonally from April through September. Therefore, estimations at this gage might be slightly over-estimated.
Remarks.--	The record is good, except for: the day of construction which is fair and the periods of ice affect which are estimated and poor. Station maintained by Division One Hydrographic staff and record developed by Patrick Tyler.
Recommendations.--	There is some ambiguity in the upper end of the rating. High flow measurements made at the power plant have been questionable. A Bank operated cableway has been procured and is pending installation at this site to better quantify higher flows at this gage. A new rating should evaluated as the channel cleanout appears to have changed the stage-discharge relation. Levels need to be run in the 2012 Water Year to monitor stability in the newly established reference marks.

STATE OF COLORADO
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06727000 BOULDER CREEK NEAR ORODELL

RATING TABLE.-- BOCOROCO14 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

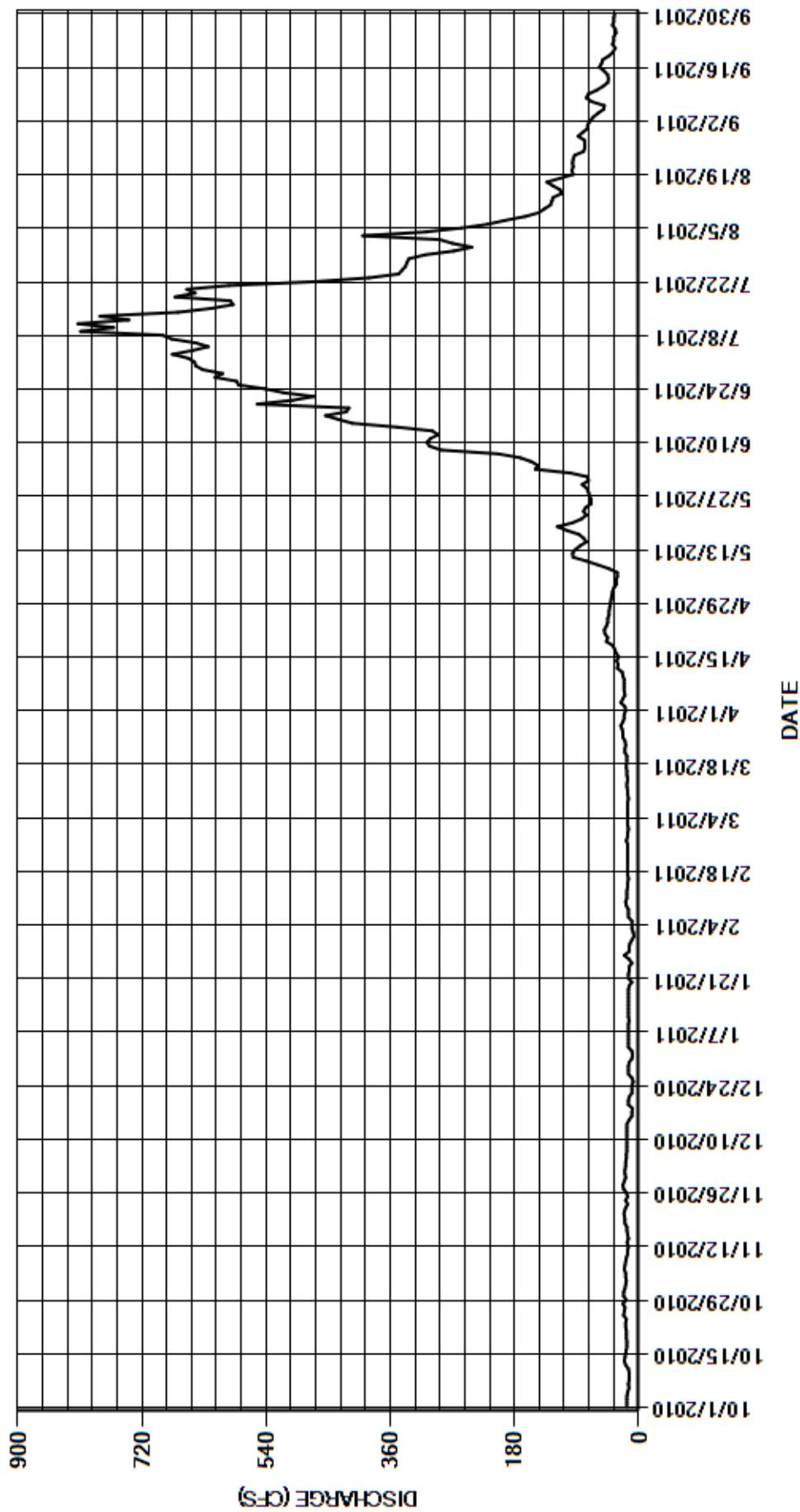
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	20	20	e9.0	e7.0	15	19	39	74	644	270	74
2	17	19	20	e10	e8.0	16	20	38	99	653	289	70
3	17	18	19	e15	e10	16	26	36	150	676	400	66
4	17	19	19	e15	e10	16	23	32	146	647	308	59
5	16	19	18	e15	e10	16	20	33	156	624	257	51
6	14	21	18	e15	e15	16	21	31	172	642	219	50
7	15	20	17	e15	e15	16	21	31	203	677	194	68
8	14	19	17	e15	e15	16	21	43	286	690	165	76
9	14	e18	17	e15	18	15	21	59	303	809	145	73
10	14	16	17	e14	19	16	23	76	307	761	137	61
11	15	16	17	e15	17	16	24	95	302	813	128	52
12	19	15	17	e15	17	17	31	96	291	739	126	45
13	21	17	17	e15	17	17	30	92	299	781	124	44
14	20	15	17	e15	16	16	32	85	350	668	112	45
15	19	16	14	e15	16	17	29	76	415	620	114	50
16	18	17	e10	e15	15	17	33	80	435	588	124	57
17	17	17	e10	15	16	18	35	87	454	592	133	54
18	17	20	e9.0	15	16	18	38	104	424	672	114	52
19	18	20	e15	14	16	17	47	118	420	643	95	43
20	18	21	e15	e10	16	17	45	96	553	655	97	37
21	18	21	e14	e15	16	20	49	83	502	594	95	34
22	19	19	e10	e15	16	20	50	76	471	469	96	38
23	19	16	e10	e14	16	19	47	80	515	391	95	36
24	18	19	e10	e14	16	20	45	77	542	348	93	36
25	22	16	e8.0	e10	16	23	45	69	580	343	80	33
26	21	18	e10	14	18	23	43	69	583	338	78	34
27	20	22	e15	21	16	24	43	71	614	336	78	38
28	23	23	e15	14	16	26	42	73	603	333	79	36
29	18	21	e15	14	---	23	41	75	632	310	88	36
30	22	19	e14	13	---	21	40	82	642	268	81	35
31	22	---	e10	e10	---	21	---	73	---	242	74	---
TOTAL	559	557	454.0	436.0	419.0	568	1004	2175	11523	17566	4488	1483
MEAN	18.0	18.6	14.6	14.1	15.0	18.3	33.5	70.2	384	567	145	49.4
AC-FT	1110	1100	901	865	831	1130	1990	4310	22860	34840	8900	2940
MAX	23	23	20	21	19	26	50	118	642	813	400	76
MIN	14	15	8.0	9.0	7.0	15	19	31	74	242	74	33
CAL YR	2010	TOTAL	27871.0	MEAN	76.4	MAX	819	MIN	7.0	AC-FT	55280	
WTR YR	2011	TOTAL	41232.0	MEAN	113	MAX	813	MIN	7.0	AC-FT	81780	

MAX DISCH: 1030 CFS AT 00:15 ON JUL 13,2011 GH 3.81 FT SHIFT -0.16 FT

MAX GH: 3.81 FT AT 00:15 ON JUL 13,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06727000 BOULDER CREEK NEAR ORODELL
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
BOULDER CREEK AT BOULDER, CO
Water Year 2011

Location.--	Lat 40° 00' 53", long 105° 16' 49", in SW SW Sec. 30, T.1N., R.70W., Boulder County, on right bank in Central Park, 1 block West of the Broadway St. Bridge over Boulder Creek. Gage is located where the center line from 11th St crosses Boulder Creek.
Drainage Area and Period of Record.--	N/A. May 2004 to present.
Equipment.--	Sutron SatLink2 with a Sutron Constant Flow Bubbler (CFB) in a 3 ft x 2.5 ft x 1 ft NEMA shelter. The primary reference is a staff gage placed on the right side of the channel slightly downstream from the shelter.
Hydrologic Conditions.--	Flows are regulated by storage in Barker Reservoir, and by diversions below Barker Reservoir. Other flows include North Boulder Creek, which converges with Middle Boulder Creek above Boulder Creek at Orodell (BOCOROCO). The channel generally will stay open and free of ice during the winter months. However, during periods of sustained cold, ice may build up on the boulder control approximately thirty feet down stream of the gage station. This year temperatures remained relatively warm with only a few periods of noted ice.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP and CFB logs as backup. Record is complete and reliable, except for the following dates when the bubbler data were bouncing possibly due to ice affect: January 2–6 and February 4,5 and 8, 2011. The DCP never missed any data this water year. The bubbler operated very well throughout the year. The visits show reasonable agreement between the bubbler and the primary reference with only minor instrument correction: December 8, 2010 (-0.01 ft), June 22 and July 22, 2011 both +0.01 ft, August 18, 2011 (-0.01 ft) and Sept 8, 2011 (-0.02 ft). The corrections were applied and prorated back to the last known point of agreement between gages. One debris correction was also noted on March 25, 2011. A branch on the control slowly collected leaves restricting flow. Since an initial point cannot be seen, the correction is prorated back to the last visit.
Datum Corrections.--	Levels were run on October 28, 2010. No correction was needed as all elevations were within tolerance.
Rating.--	Section control is a man placed boulder weir approximately 50 feet downstream,. Another boulder control approximately 30 ft further downstream may affect the recorded gage heights at very high flows. Cobble and boulder riffles occupy the intermediate stretch between the two controls. The channel banks are part of the control for higher stages. Rating No. 3, developed May 24, 2005 was used again this year. Rating 3 was extended in 2010 and again in 2011 to accomodate high flows, however there is very little definition for the higher ranges. Eighteen measurements (Nos. 136-153) were made this year, and ranged in discharge from 11.3 to 846 cfs. They cover the range of mean daily flows experienced throughout the water year except for low daily flows experienced on the following days: October 8, 9 and December 16, 18, 25, and 31 (2010); January 1, 2, and February 1, 2, 21, 23, 23 and March 10 (2011). The peak flow of 973 cfs occurred at 2045 July 13, 2011 at a gage height of 4.31 ft. with a shift of 0.10 ft. It exceeded Measurement 147, made July 9, 2011, by 0.22 feet in stage.
Discharge.--	Shifting section control method used. Shifts are caused by scour and fill of the gage pool. Measurements show unadjusted shifts varying between -0.10 and 0.10 feet. All measurements were given full weight and applied, except Measurement 140 which was adjusted 2.7%, to smooth shift distribution. Measurement No. 145 was not used for record development. Shifts were applied as defined by measurements and distributed by time proration for the periods: Oct 1, 2010- March 25, 2011, and August 19 – Sept 30, 2011. . Shifts were distributed by stage for the periods: March 25 – August 19, 2011 using variable stage-shift relationships. BOCOBOCOVST01 (March 25 - July 13, 2011(Peak)) and BOCOBOCOVST11-2 (July 13 (Peak) - August 19, 2011).
Special Computations.--	A spreadsheet is normally used to compare the upstream gage (BOCOROCO) with the downstream gage (BOCOBOCO) in the winter. The spreadsheet is used for BOCOROCO to estimate winter flows, and at BOCOBOCO to verify change in flow events. For the periods of January 2-6 and February 4, 5 and 8, 2011 (not known if ice affect or bubbler chatter), the flows were estimated using adjacent good record and in some cases rounded to the nearest 5 cfs.
Remarks.--	Record is good, except for periods of possible ice affect/bubbler chatter, which are estimated and poor. July 16, 17, 21, and 22 are also rated as fair due to inconsistencies in the mass balance spreadsheet used to compare the upstream and downstream gages (BOCOROCO vs. BOCOBOCO). On these days, the balance was not within a good range and cause can only be described as lack of rating definition. Measurements have not been made in the range of flow experienced on these days and the drop in flows are not seen at the above station. It is assumed that a critical break-point in the rating has yet to be defined. Station maintained and record developed by Patrick Tyler.
Recommendations.--	A new rating should be developed using recent high water measurements. High water should be measured as often as possible to obtain better definition.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

BOULDER CREEK AT BOULDER, CO

RATING TABLE-- BOCOBODO3 USED FROM 01-OCT-2010 TO 30-SEP-2011

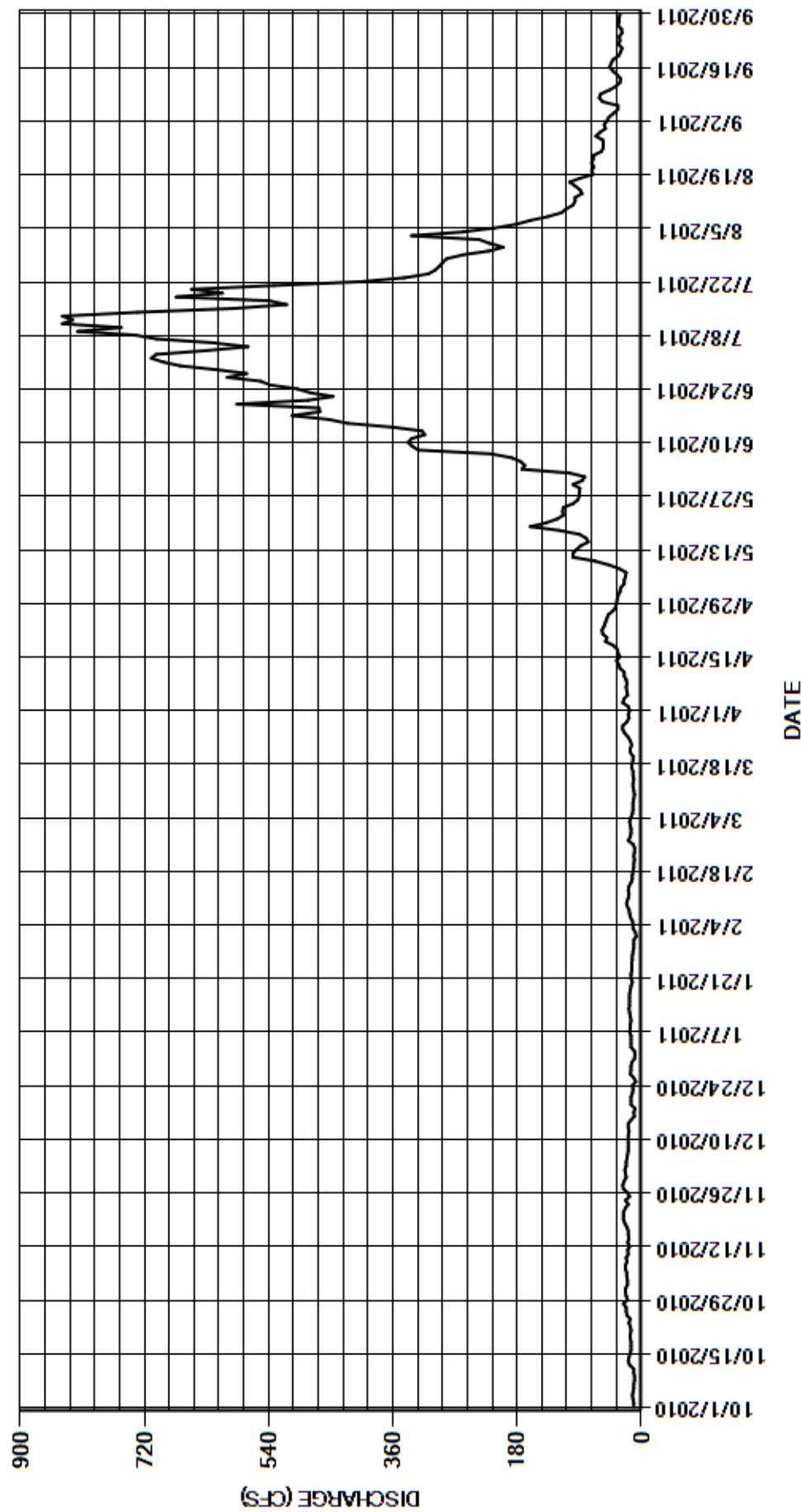
DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011												
DAY	MEAN VALUES											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11	23	23	9.3	7.3	15	17	34	82	693	220	54
2	11	20	24	e10	8.6	16	19	31	104	710	235	50
3	12	20	22	e15	12	17	27	30	173	703	333	47
4	13	21	22	e15	e12	15	25	25	169	630	258	40
5	12	21	21	e15	e13	13	20	25	175	570	213	34
6	11	23	20	e15	16	12	21	23	188	619	181	34
7	11	23	19	17	17	12	22	22	217	702	161	56
8	10	21	19	16	e18	12	21	32	323	732	135	61
9	10	22	19	16	21	11	22	47	332	817	116	59
10	11	19	19	15	21	10	25	67	338	754	109	47
11	11	20	19	16	19	11	25	99	333	839	99	37
12	17	17	18	17	18	12	31	99	314	824	96	31
13	19	20	19	18	19	12	33	94	318	839	96	30
14	18	18	19	17	18	11	36	88	361	730	86	35
15	16	19	15	17	15	12	31	77	426	591	89	41
16	15	19	10	17	13	12	34	80	453	514	96	46
17	15	21	11	17	13	14	35	90	506	539	104	44
18	15	24	9.0	16	12	14	41	118	466	674	89	41
19	16	26	15	15	11	12	52	161	467	607	70	33
20	16	26	15	13	11	12	50	138	586	652	72	30
21	15	26	15	15	10	16	56	122	483	532	69	28
22	16	23	13	15	11	16	57	113	447	405	72	33
23	18	19	12	14	10	14	54	114	480	344	70	31
24	16	23	13	14	9.6	16	52	113	499	309	69	32
25	21	17	8.1	14	12	19	50	99	538	299	58	28
26	22	20	11	13	19	24	48	92	552	293	55	29
27	22	26	16	13	16	27	41	90	600	288	55	34
28	26	27	15	12	15	27	37	90	572	282	56	32
29	20	25	15	11	---	21	36	89	616	259	66	32
30	22	22	14	11	---	18	35	99	668	221	60	31
31	23	---	10	11	---	19	---	86	---	200	52	---
TOTAL	491	651	500.1	449.3	397.5	472	1053	2487	11786	17171	3540	1160
MEAN	15.8	21.7	16.1	14.5	14.2	15.2	35.1	80.2	393	554	114	38.7
AC-FT	974	1290	992	891	788	936	2090	4930	23380	34060	7020	2300
MAX	26	27	24	18	21	27	57	161	668	839	333	61
MIN	10	17	8.1	9.3	7.3	10	17	22	82	200	52	28
CAL YR	2010	TOTAL	27307.4	MEAN	74.8	MAX	667	MIN	7.0	AC-FT	54160	
WTR YR	2011	TOTAL	40157.9	MEAN	110	MAX	839	MIN	7.3	AC-FT	79650	

MAX DISCH: 973 CFS AT 20:45 ON JUL 13,2011 GH 4.31 FT SHIFT 0.1 FT

MAX GH: 4.31 FT AT 20:45 ON JUL 13,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

BOULDER CREEK AT BOULDER, CO
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06729450 SOUTH BOULDER CREEK BELOW GROSS RESERVOIR
Water Year 2011

Location.--	Lat. N39° 56' 18.12", Long. W105° 20' 52.68" (NAD83). Gage is located on the right side of a 25-ft. Parshall Flume approximately 0.8 mi. downstream of Gross Dam in Boulder County, CO.
Drainage Area and Period of Record.--	93.2 sqmi (USGS Colorado StreamStats utility) of east slope drainage area. Transmountain water delivered via Moffat Tunnel from tributaries of the Fraser River in the Colorado River Basin are routed through Gross Reservoir and will pass through this structure to terminal storage at other facilities. Daily values are available from the DWR from October 1, 1967 to present.
Equipment.--	Digital incremental Sutron 8500 shaft encoder connected to a Sutron SatLink2 Data Collection Platform (DCP) transmitting hourly and a Stevens A-35 water stage recorder in a rectangular concrete shelter and Ha stilling well at a 25-ft. Parshall Flume. The primary reference is an electric tape gage with a supplemental staff gage located in the flume. A foot bridge crosses the flume above the Ha location and is used for measuring higher flows. Facilities are owned, operated and maintained by the Denver Water Department.
Hydrologic Conditions.--	Gross Reservoir is an on-stream reservoir; therefore, controlled release from Gross Reservoir as regulated by the Denver Water Department, and only partial control only when the reservoir's spillway is in use. Water retained and released by Gross Reservoir includes transmountain water conveyed from the Fraser River Basin via the Moffat Tunnel Near Rollinsville, CO (MOFTUNCO) as well as waters native to South Boulder Creek. Water released from Gross Reservoir into South Boulder Creek can be diverted to Denver's treatment facilities about 3 miles downstream at the South Boulder Creek Diversion (BOSDELCO) structure.
Gage-Height Record.--	The primary record is 15-minute telemetered data with 15-minute logged DCP data and chart record as back up. The record is complete and reliable except for February 1,2 and 9, 2011 when the stage-discharge relationship was affected by ice. Missing values were filled in with logged DCP values without loss of accuracy. However, the DCP failed to log data for one hour on January 4th, 2011, and chart record was used without loss of accuracy. Checks between the primary and backup records agreed within +/- 0.02 feet. Instrument calibration was supported by 16 visits made to the gage this year. One instrument correction of -0.01 ft was noted early in the year and applied to the record.
Datum Corrections.--	Levels were last run on November 24, 2011 using the flume's crest as base. The ETG index elevation was found to be within allowable tolerances. R.M. 4 was established on this date.
Rating.--	The control is a 25-ft. Parshall Flume approximately 0.8 mi downstream of Gross Dam and its outlet facilities. A standard 25-ft. Parshall Flume rating, STD25FTP, was continued in use for all of WY2011. The flume is generally in good condition, although the floor has some areas of increased roughness that cause velocity variations and helps algal growth to get established. Shifts at lower stages are generally due to algal growth throughout the flume. The stilling pool upstream of the flume is inadequate and scour and deposition of materials above the flume will affect its performance. For much of this year a sand bar has been developing just upstream of the flume on the left side of the channel and is further contributing to uneven approach velocities. Thirteen measurements (Nos. 684-696) were made this year ranging in discharge from 12.2 to 481 cfs (excluding No. 693 which was not used). Measurements made this year cover the range in stage experienced this year well except for February 10 through March 1, 2011 when average daily flows were below 12 cfs which is not well defined by measurements . The peak flow of 475 cfs occurred at 0500 on June 13, 2011 at a gage-height of 2.74 ft with a shift of 0.00 ft. The peak exceeded high flow Measurement No. 692 made June 10, 2011 by 0.03 ft. of stage.
Discharge.--	Shifting control method was used all year. Open water measurements showed shifts varying between -0.03 ft and +0.05 ft. Shifts were distributed by time with consideration of stage for the entire water year. Shifts at this structure which fall within 5% of the rating have historically been adjusted to zero at the time of the measurement by agreement with Denver Water Department. This has worked for flows above about 15-20 cfs. However, flows below about 15-20 cfs seem to be susceptible to approach conditions and tend to run a small negative shift which does not zero out. For flows below about 15 cfs, the measurement history indicates that a negative shift of -0.02 or -0.03 ft seems to be resident in the flume. Measurement Nos. 685, 686, 688, 689, 690, 692, 694, 695 and 696 (all above about 15 cfs) were all adjusted from 1% to 4% to a zero shift. Measurement No. 693 was not considered due to an error in measurement practices. Msmt Nos. 684 and 687 (both below 15 cfs) had small negative shifts and were given full weight.
Special Computations.--	Discharge for ice affected periods were estimated from adjacent periods of good record. This record is directly used to estimate winter flows at the South Boulder Creek At Eldorado Springs (BOCESLCO) gage.
Remarks.--	The record is good, except for ice affected days which are estimated and poor and periods when the average daily flow fell below 12 cfs which are considered fair. Station maintained and record developed by Patrick Tyler.
Recommendations.--	Better documentation of Denver Water staff's daily visits to the gage is requested. Also, the operator should be consulted to find out if release was completely constant during any ice periods. If so, any ice record can be estimated without loss of accuracy using prior and subsequent discharges. The gravel bar developing upstream of the flume should be watched for further impact on the flume's performance. Removal and deepening of the stilling pool upstream of the flume is highly recommended. Levels need to be run again in the 2012 Water Year to confirm establishment of R.M. 4.

STATE OF COLORADO
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06729450 SOUTH BOULDER CREEK BELOW GROSS RESERVOIR

RATING TABLE.-- STD25FTP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

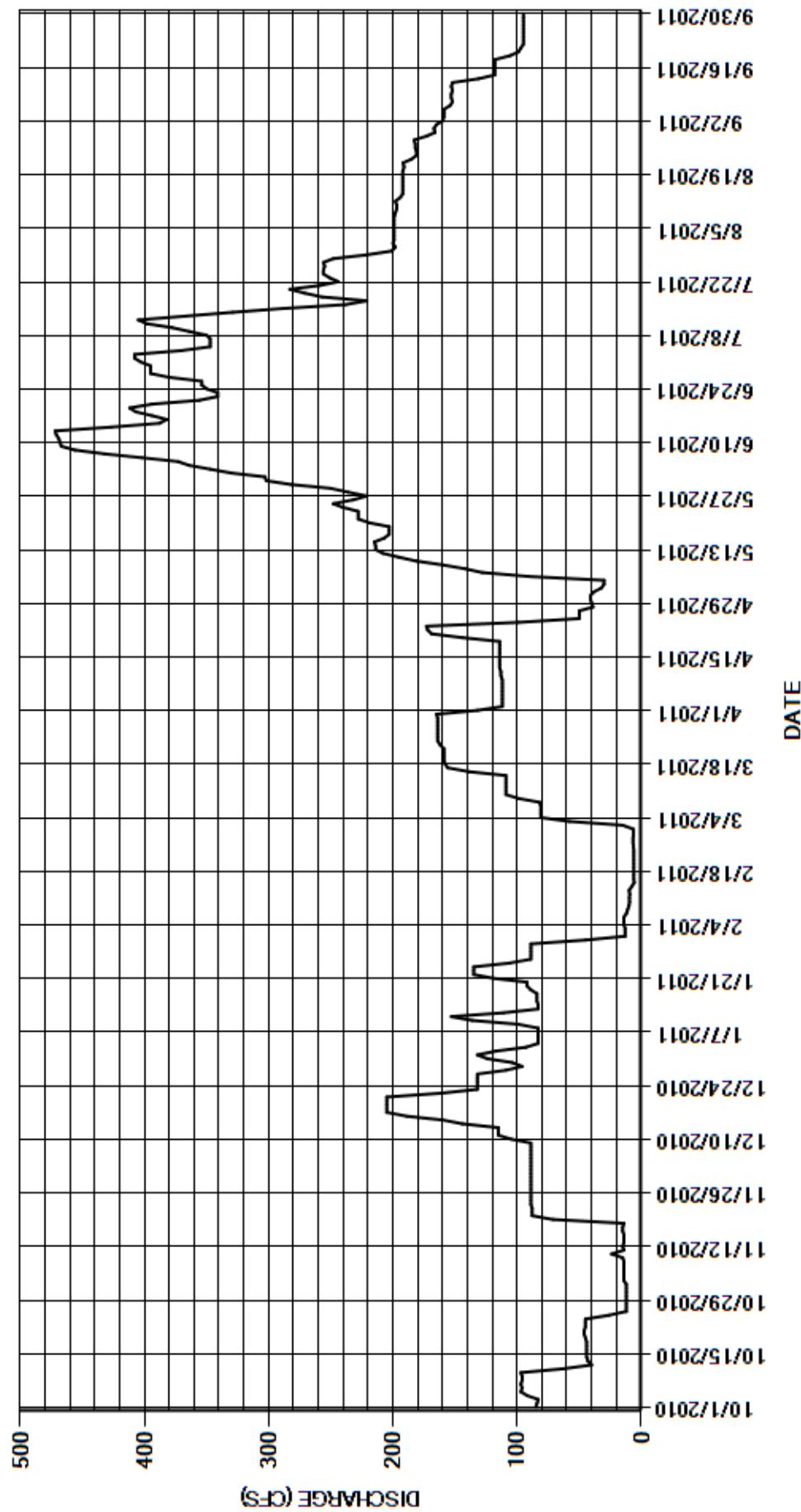
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	85	12	89	132	e13	6.6	132	41	303	403	200	165
2	84	12	89	117	e13	15	112	38	330	408	199	160
3	83	14	89	93	13	58	112	32	347	408	199	159
4	92	14	89	83	14	81	112	30	364	370	199	159
5	97	14	89	83	14	81	112	30	373	347	199	159
6	96	14	89	83	14	81	112	91	402	347	199	154
7	97	14	89	83	12	81	112	128	432	347	199	152
8	96	14	89	83	11	82	112	142	456	350	199	153
9	96	15	89	99	e10	99	112	160	467	364	198	153
10	97	24	105	136	9.5	109	113	181	468	378	197	152
11	63	14	115	153	9.6	109	113	195	469	398	197	153
12	40	15	115	111	9.4	109	114	208	471	405	198	152
13	43	14	115	83	9.9	109	114	214	472	367	194	131
14	44	14	144	83	7.7	109	114	214	427	329	192	118
15	44	14	160	84	5.8	109	114	215	388	288	192	118
16	44	15	189	84	6.1	139	114	207	382	238	192	118
17	44	15	205	84	6.1	156	114	203	394	221	192	118
18	44	14	205	89	6.1	158	114	203	407	257	192	118
19	45	71	205	92	6.1	159	114	203	412	271	192	106
20	46	88	205	92	6.1	159	144	219	394	283	192	99
21	46	88	205	119	6.1	159	169	228	356	259	191	97
22	45	88	161	135	6.1	159	172	228	341	244	192	95
23	45	89	132	135	6.1	162	173	228	341	251	185	95
24	45	89	132	135	6.3	164	99	240	350	256	181	95
25	26	89	132	106	6.6	164	50	248	354	256	181	95
26	12	89	132	89	6.6	164	50	232	354	255	182	95
27	12	89	132	89	6.6	164	50	221	380	256	182	95
28	12	89	109	89	6.5	164	39	236	395	248	183	95
29	12	89	96	89	---	164	40	250	395	221	173	95
30	12	89	104	89	---	164	41	282	395	201	166	95
31	12	---	124	45	---	165	---	302	---	198	167	---
TOTAL	1659	1309	4023	3067	247.3	3802.6	3193	5649	11819	9424	5904	3749
MEAN	53.5	43.6	130	98.9	8.83	123	106	182	394	304	190	125
AC-FT	3290	2600	7980	6080	491	7540	6330	11200	23440	18690	11710	7440
MAX	97	89	205	153	14	165	173	302	472	408	200	165
MIN	12	12	89	45	5.8	6.6	39	30	303	198	166	95
CAL YR	2010	TOTAL	35508.3	MEAN	97.3	MAX	485	MIN	5.6	AC-FT	70430	
WTR YR	2011	TOTAL	53845.9	MEAN	148	MAX	472	MIN	5.8	AC-FT	106800	

MAX DISCH: 475 CFS AT 05:00 ON JUN 13,2011 GH 2.74 FT SHIFT 0 FT

MAX GH: 2.74 FT AT 05:00 ON JUN 13,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06729450 SOUTH BOULDER CREEK BELOW GROSS RESERVOIR
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
SOUTH BOULDER CREEK DIVERSION NEAR ELDORADO SPRINGS
Water Year 2011

Location.--	Lat 39°55'58", long 105°18'29", Boulder County. Diverts Denver Water Dept. rights released from Gross Reservoir to South Boulder Creek.
Drainage Area and Period of Record.--	N/A. October 1958 to present.
Equipment.--	Weekly graphic water stage recorder and satellite monitoring (DCP and float driven shaft encoder) in a timber shelter and concrete well. An electric tape is used to reference the gage, with a supplemental outside staff. The station is maintained by the Denver Water Department.
Hydrologic Conditions.--	Controlled diversion of water released from Gross Reservoir, about 3 miles upstream, to Ralston Reservoir for municipal use. The diversion is the delivery point for west slope water diverted through Moffat Tunnel. Municipal diversions of 5-10 cfs are made downstream. Accurate measurement at this gage is important to insure that the proper amount of water passes to the downstream users. A transitory peak often occurs prior to a shut down as the canal is used to help drain the diversion pool.
Gage-Height Record.--	The primary record is 15-minute shaft encoder data taken from satellite monitoring with chart record as back up. Primary record agreed with the recorder data within +/-0.02 foot. The record is complete and reliable. There were several days with a single missing unit value. The DCP malfunctioned from 0000 Mar 2 to 1215 Mar 4, and from 1230 Jul 11 to 1430 Jul 12. Missing data were replaced with backup chart record without loss of accuracy. The diversion was off or only producing trickle flows on the following days: Oct. 26–Nov. 19, 2010, Feb. 1–Mar 2, 2011, April 24–May 6, 2011 .
Datum Corrections.--	Levels were last run November 14, 2006 across the flume crest. No corrections were necessary.
Rating.--	Control is a 12 foot Parshall Flume. Positive or negative shifts can be caused by approach conditions, particularly at high flows. A large timber is hung in the canal upstream to damp the flow from the headgate. Moss can become a factor if the diversion runs for a long period. A standard 12 foot Parshall Flume rating was used all year. It is defined for all ranges of flow experienced. Flows did not get above 210 cfs for the 2011 Water Year. Four measurements (Nos. 370-373) were made this water year, ranging in discharge between 29.2 and 201 cfs. The peak flow of 199 cfs occurred at 2330 December 19, 2010 at a gage height of 2.47 ft with a shift of 0.00 ft. It exceeded measurement No. 368 (made on December 17, 2010), by 0.02 ft. in stage.
Discharge.--	Shifting control method was used. Measurements showed unadjusted shifts ranged from -0.03 to 0.04 ft. Per agreement with Denver Water Department, shifts are adjusted to 0.00 ft and the rating is applied directly to the gage height record to compute discharge. All measurements (Nos. 370 – 373) were adjusted from -5% to +3% to zero the shifts.
Special Computations.--	Zero flow periods are verified against Denver Water Department Operations spreadsheets. Comparison of daily flows must take into account that it appears that Denver's daily flows are computed from noon on the accounting day to noon the next day.
Remarks.--	The record is good. Trickle flows under the diversion gate were zeroed out per agreement with Denver Water Department. Station maintained and record developed by Patrick Tyler.
Recommendations.--	Included in the record is a mass balance between BOCBGRCO, BOCELSCO, and BOSDELCO. There have been some inconsistencies (in past measurements) in the way depths and widths are being taken. Using a single average depth for a measurement does not yield results that are defensibly more accurate than the basic flume table. Individual depths need to be taken in each section rather than averaging depths for the entire cross section. When moss is observed and a negative shift is measured which supports a moss effect, the water commissioner should be notified. Depending on his input, Denver may be requested to clean the flume.

STATE OF COLORADO
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SOUTH BOULDER CREEK DIVERSION NEAR ELDORADO SPRINGS

RATING TABLE.-- STD12FTP USED FROM 01-OCT-2010 TO 30-SEP-2011

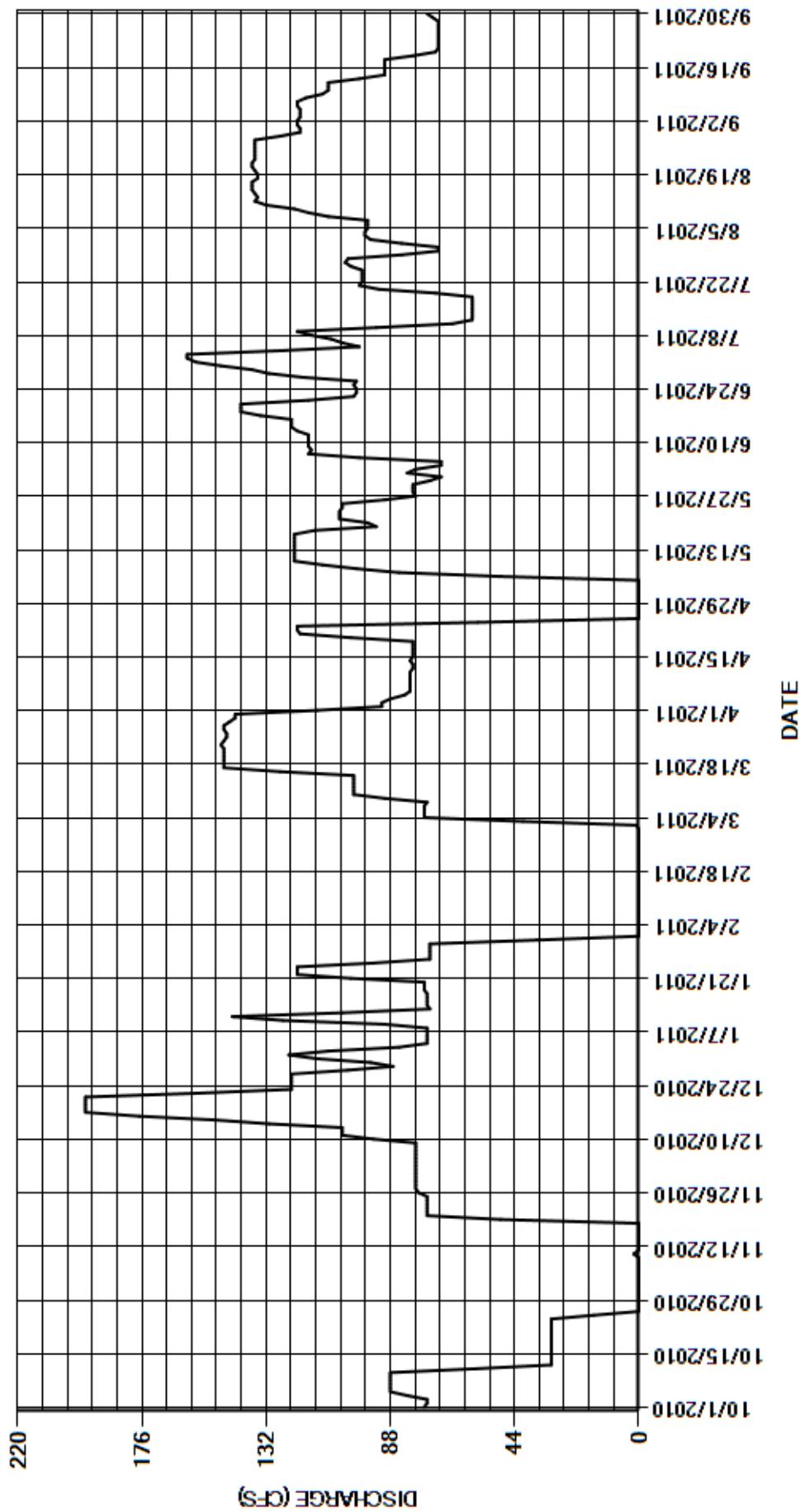
DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011												
DAY	MEAN VALUES											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	76	0.00	79	124	0.00	0.00	114	0.00	70	157	84	121
2	75	0.00	79	110	0.00	0.83	91	0.00	82	160	95	121
3	75	0.00	79	85	0.00	41	91	0.00	79	160	97	120
4	82	0.00	79	75	0.00	76	88	0.00	70	126	97	120
5	88	0.00	79	75	0.00	76	83	0.00	70	99	96	120
6	88	0.00	79	75	0.00	76	81	49	99	105	96	121
7	88	0.00	79	75	0.00	76	81	85	117	109	96	121
8	88	0.00	79	75	0.00	75	81	100	116	116	110	118
9	88	0.00	79	90	0.00	90	81	112	117	121	117	112
10	88	1.8	94	126	0.00	101	81	122	117	93	122	110
11	58	0.00	105	144	0.00	101	81	122	117	66	132	110
12	31	0.00	105	105	0.00	101	80	122	117	59	136	110
13	31	0.00	105	74	0.00	101	80	122	121	59	135	99
14	31	0.00	131	75	0.00	101	81	122	123	59	136	90
15	31	0.00	150	75	0.00	101	80	122	123	59	137	90
16	31	0.00	177	75	0.00	127	80	122	123	59	137	90
17	31	0.00	196	75	0.00	147	80	122	134	59	137	90
18	31	0.00	196	76	0.00	147	80	115	141	59	135	90
19	31	49	196	76	0.00	147	80	93	141	72	135	80
20	31	75	196	76	0.00	147	102	96	141	92	136	72
21	31	75	196	102	0.00	147	120	106	117	99	137	71
22	31	75	156	121	0.00	147	121	106	101	98	137	71
23	31	75	123	121	0.00	148	121	106	100	98	136	71
24	31	75	123	121	0.00	147	57	105	100	98	136	71
25	16	75	123	94	0.00	146	0.00	105	101	98	136	71
26	0.00	78	123	74	0.00	146	0.00	90	100	102	136	71
27	0.00	79	123	74	0.00	147	0.00	79	119	104	136	71
28	0.00	79	103	74	0.00	147	0.00	80	131	103	136	71
29	0.00	79	87	74	---	145	0.00	80	137	84	127	73
30	0.00	79	95	74	---	143	0.00	80	148	71	120	75
31	0.00	---	114	36	---	143	---	74	---	71	120	---
TOTAL	1313.00	894.80	3728	2726	0.00	3437.83	2115.00	2637.00	3372	2915	3823	2821
MEAN	42.4	29.8	120	87.9	0.000	111	70.5	85.1	112	94.0	123	94.0
AC-FT	2600	1770	7390	5410	0	6820	4200	5230	6690	5780	7580	5600
MAX	88	79	196	144	0.00	148	121	122	148	160	137	121
MIN	0.00	0.00	79	36	0.00	0.00	0.00	0.00	70	59	84	71
CAL YR	2010	TOTAL	19635.40	MEAN	53.8	MAX	196	MIN	0.00	AC-FT	38950	
WTR YR	2011	TOTAL	29782.63	MEAN	81.6	MAX	196	MIN	0.00	AC-FT	59070	

MAX DISCH: 199 CFS AT 23:30 ON DEC 19,2010 GH 2.47 FT SHIFT 0 FT

MAX GH: 2.47 FT AT 23:30 ON DEC 19,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH BOULDER CREEK DIVERSION NEAR ELDORADO SPRINGS
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
SOUTH BOULDER CREEK NEAR ELDORADO SPRINGS
Water Year 2011

Location.--	Lat. N39° 55' 58.52", Long. W105° 18' 18.91" (NAD83) in Boulder County, CO. Gage is located on the left side of a placed boulder cross-vane control structure 1.25 miles upstream from the previous gage location, 0.5 miles downstream from the South Boulder Creek Diversion Near Eldorado Springs, CO (BOSDELCO) stream gage or approximately 6 miles southwest of Boulder, CO and approximately 4 miles downstream of Gross Reservoir.
Drainage Area and Period of Record.--	107 sqmi (USGS Colorado StreamStats utility). April 1888 – October 1892; May 1895 – September 1901; August 1904 to present.
Equipment.--	From October 1, 2010 to December 9, 2010; digital incremental shaft encoder connected to a Sutron SatLink1 Data Collection Platform and water-stage recorder in a metal box shelter overtop a corrugated metal pipe stilling well. A metal drop tape and adjustable reference point were the primary reference with a supplemental cantilever style chain gage. OneRain operated a pressure transducer and radio transmitter.
	From December 10, 2010 through the end of the water year; Sutron Constant Flow Bubbler (CFB) stage sensor and temperature sensor connected to a Sutron SatLink2 DCP in a 5-ft. by 5-ft. timber shelter at a placed boulder cross-vane control structure. A cantilever style chain gage located 15-ft. downstream of the shelter (overtop the CFB's orifice line) serves as the primary reference with no provision for a supplemental reference. A bank operated cableway was placed in the 2011 Water Year is 10-ft. downstream from the shelter.
Hydrologic Conditions.--	Drainage area of heavily forested terrain of varying topography. Stream is heavily regulated upstream of the gage since May 1, 1955. Moffat Tunnel, a transmountain diversion owned and operated by Denver Water intersects South Boulder Creek just after day lighting near Rollinsville, CO. Gross Reservoir (capacity 43,060 AF), an on-channel reservoir owned and operated by Denver Water intercepts and regulates all South Boulder Creek and tributary flows upstream of this gage. Releases made from Gross Reservoir (including spilled water) are recorded at the South Boulder Creek Below Gross Reservoir (BOCBGRCO) gage. Released water can then be subsequently diverted via the South Boulder Creek Diversion Near Eldorado Springs, CO (BOSDELCO) gage which routes water to Ralston Reservoir. The BOCBGRCO and BOSDELCO gages are both owned and operated by Denver Water. The channel is straight for approximately 200-ft. upstream and 300-ft. downstream of the gage. There is about 15 sq mi of drainage between Gross Reservoir and the gage. During conditions when there is low snow melting or storm runoff, significant flows can be seen at the gage when Gross release has been curtailed to minimum. The control will regulate flows at all anticipated stages.
Gage-Height Record.--	From October 1, 2010 through December 9, 2010 the primary record is 15-minute satellite data with chart record as backup. From December 10, 2010 through the end of the water year the primary record is 15-minute satellite data with 15-minute logged CFB data as backup. Frequent visits to the gage by DWR staff tracked and ensured instrument calibration. The record is complete and reliable except for the following periods: December 10, 2010 through April 18, 2011 when the stage-discharge relationship was affected due to ice and partial failure of the control and May 19-26, 2011 when the CFB unit malfunctioned. Missing values occurring on October 22-25, November 20-26, and 30 and December 8-9, 2010 were filled in from chart data without loss of accuracy.
Datum Corrections.--	Levels were last run on July 2, 2010. Reference marks (R.M.) 1-4 as well as the cantilever gage were established at this time. New gage datum is completely independent of the decommissioned gage.
Rating.--	From October 1 through December 9, 2010 the control was a rock and concrete core dam with hand placed rock approximately 10-ft. below the gage. In use since May 23, 2003, Rating No. 23 was used from October 1 through December 9, 2009. It is defined by measurements to 555 cfs. The "dam" was heavily deteriorated, driving relocation of the gage. From December 10, 2010 through the end of the water year the control is a placed boulder cross-vane structure. Rating BOCEL2CO01, developed during the 2010 Water Year was created by correlating average day gage-height data recorded at the new site against average day discharge values computed at the old site during periods of stable flow when both gages were operating. BOCEL2CO01 was used from December 10 through the end of the water year. Seventeen discharge measurements (Nos. 506-522) were made this year ranging in discharge from 10.3 to 361 cfs covering the range in stage experience this year well. The peak flow of 423 cfs occurred at 0900 on June 12, 2011 at a gage-height of 3.78 ft. with a shift of -0.12 ft. It exceeded high flow Measurement No. 516 made June 13, 2011 by 0.12 ft. of stage.
Discharge.--	Shifting control method was used for all periods of open and reliable gage-height record. Shifts are caused by accumulation of debris and material above the control. Shifts were mainly applied by time as defined by measurements. Stage dependent shifting was used from April 21, 2011 through June 13, 2011 using variable shift table BOCELSCOVST01 defined by seven measurements (Nos. 510-516) made during the period of use. Open water measurements showed shifts varying between -0.12 and +0.01 ft. All measurements were given full weight.

Special Computations.-- Discharge from December 10, 2010 through April 18, 2011 and May 19-26, 2011 was based on mass balance calculations and discharge measurements made during the periods. Because the channel is heavily regulated upstream of this point, record can be determined within fair accuracy by mass balancing the release from Gross Reservoir minus diversions via the South Boulder Creek Diversion. Reasonable consistency is seen in the before and after periods of good record validating this methodology.

Remarks.-- The record is good except for periods when the stage-discharge relation was affected by partial failure of the control (October 10, 2010 through April 18, 2011) and when gage-height record was questionable (May 19-26, 2011) which are estimated and fair. July 2-9, 14 and August 3, 2011 are downgraded to fair due to large instrument corrections and instability in gage-height readings. Station maintained by Russell Stroud and Patrick Tyler. Record developed by Patrick Tyler.

Recommendations.-- The new station is becoming more stable as the issues are resolved. The control was repaired and unstable equipment replaced. Being a new gage at a new location, a careful eye should be kept for any changing conditions. A full series of measurements are needed to define both ends of the new rating. Trimming the banks of willows will help with high water measurements, as they encroach on the section. Levels must be run in the 2012 Water Year to confirm gage and reference mark establishment

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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SOUTH BOULDER CREEK NEAR ELDORADO SPRINGS

RATING TABLE-- BOCELS CO23 USED FROM 01-OCT-2010 TO 09-DEC-2010
BOCEL2 CO01 USED FROM 10-DEC-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.5	11	12	e8.0	e13	e6.0	e18	40	229	261	105	41
2	9.0	19	11	e7.0	e13	e14	e21	39	251	259	97	39
3	8.3	12	11	e8.0	e13	e17	e21	34	272	275	94	38
4	9.5	13	11	e8.0	e14	e5.0	e24	31	298	281	99	38
5	10	13	11	e8.0	e14	e5.0	e29	30	308	253	101	38
6	9.7	13	11	e8.0	e14	e5.0	e31	38	307	240	99	33
7	9.9	13	11	e8.0	e12	e5.0	e31	43	322	239	101	31
8	9.8	13	11	e8.0	e10	e7.0	e31	43	344	232	88	37
9	9.9	13	11	e9.0	e10	e9.0	e31	46	364	240	78	44
10	10	14	e11	e10	e9.0	e8.0	e32	57	359	257	72	45
11	10	14	e10	e9.0	e9.0	e8.0	e32	72	353	300	60	44
12	9.2	13	e10	e6.0	e9.0	e8.0	e34	85	392	331	60	43
13	9.7	13	e10	e9.0	e10	e8.0	e34	92	370	300	57	36
14	11	13	e13	e8.0	e8.0	e8.0	e33	92	314	246	54	31
15	11	14	e10	e9.0	e6.0	e8.0	e34	92	277	211	53	28
16	11	13	e12	e9.0	e6.0	e12	e34	84	249	167	53	28
17	11	13	e9.0	e9.0	e6.0	e9.0	e34	79	258	149	52	29
18	11	13	e9.0	e13	e6.0	e11	e34	91	283	192	53	31
19	11	15	e9.0	e16	e6.0	e12	36	e110	283	195	54	29
20	12	15	e9.0	e16	e6.0	e12	42	e125	259	191	51	29
21	13	15	e9.0	e17	e6.0	e12	43	e125	237	158	56	27
22	12	15	e5.0	e14	e6.0	e12	45	e125	252	144	48	25
23	12	16	e9.0	e14	e6.0	e14	46	e125	242	149	44	24
24	12	16	e9.0	e14	e6.0	e17	47	e140	255	154	42	23
25	12	15	e9.0	e12	e6.0	e18	50	e145	268	152	42	23
26	11	13	e9.0	e15	e6.0	e18	50	e145	271	148	42	23
27	11	11	e9.0	e15	e6.0	e17	50	143	295	149	42	22
28	11	12	e6.0	e15	e6.0	e17	40	161	295	143	42	23
29	11	12	e9.0	e15	---	e19	40	170	271	136	42	21
30	11	12	e9.0	e15	---	e21	40	192	268	120	41	19
31	11	---	e10	e9.0	---	e22	---	216	---	113	42	---
TOTAL	328.5	407	305.0	341.0	242.0	364.0	1067	3010	8746	6385	1964	942
MEAN	10.6	13.6	9.84	11.0	8.64	11.7	35.6	97.1	292	206	63.4	31.4
AC-FT	652	807	605	676	480	722	2120	5970	17350	12660	3900	1870
MAX	13	19	13	17	14	22	50	216	392	331	105	45
MIN	8.3	11	5.0	6.0	6.0	5.0	18	30	229	113	41	19

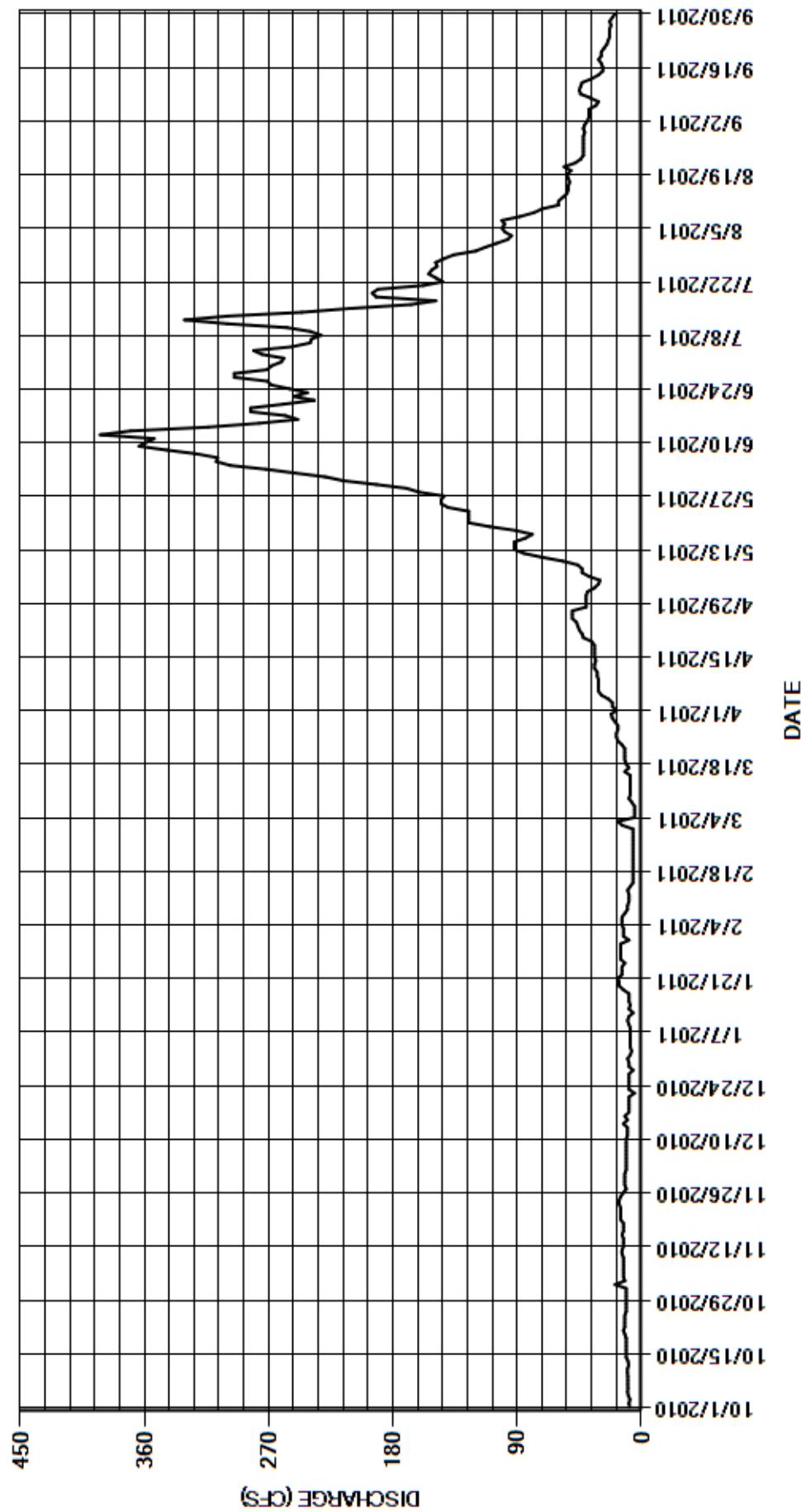
CAL YR	2010	TOTAL	18167.4	MEAN	49.8	MAX	473	MIN	3.8	AC-FT	36040
WTR YR	2011	TOTAL	24101.5	MEAN	66.0	MAX	392	MIN	5.0	AC-FT	47810

MAX DISCH: 423 CFS AT 09:00 ON JUN 12,2011 GH 3.78 FT SHIFT -0.12 FT

MAX GH: 3.78 FT AT 09:00 ON JUN 12,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH BOULDER CREEK NEAR ELDORADO SPRINGS
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06730300 COAL CREEK NEAR PLAINVIEW
Water Year 2011

Location.--	Lat 39°52'40", long 105°16'39" (Eldorado Springs Quad. 1965, 1:24,000 scale) in SE1/4, NE1/4, Sec. 13, T. 2S, R. 71W, Jefferson County, on left bank 100 ft upstream from culvert on State Hwy 72, 1.2 miles south of Plainview, 5 miles downstream from Beaver Creek and 9 miles north of Golden, CO.
Drainage Area and Period of Record.--	15.1 mi ² ; 1959 to present.
Equipment.--	Graphic water-stage recorder, Sutron shaft encoder and a Sutron Satlink Data Collection Platform (DCP) in a 42-inch corrugated metal pipe shelter. The base gage is a metal drop tape with adjustable Reference Point (RP) mounted on the instrument shelf with a supplemental outside cantilever gage located 2.5 feet downstream of the shelter. The control is a low-head concrete dam constructed with a pipe through the control to allow for better bucket measurement during low flow conditions. The pipe is plugged when measurement by bucket is not occurring.
Hydrologic Conditions.--	Drainage area consists mainly of forested mountainous terrain. The gage is located at the mouth of Coal Creek Canyon which has several small developments along the banks of Coal Creek. Gage is subject to rapid increases in stage resulting from rain events and runoff from hardened areas through the canyon. The channel is straight for approximately 100 feet upstream and approximately 100 feet downstream of the station. The stream is constrained to one channel at all stages. During high flow, small cobble and gravel migrate through the channel, occasionally causing changes in conditions.
Gage-Height Record.--	The primary record is 15-minute telemetered data with chart record as backup. The record is complete and reliable, except for: October 24-29 when debris had collected on control; November 25, 26, and 30, 2010 for ice affect; December 18, 30, and 31, 2010 for ice affect; January 1-6, 9-12, 19-20, 23-25, and 31, 2011 for ice affect; February 1-26, 2011 for ice affect; and March 8 and 9, 2011 for ice affect. The entire period November 25, 2010 thru March 9, 2011 was possibly ice affected. Gage height was affected twice by Hydrographer activity in the water on July 13 and Sept 27, 2011. Negative gage height values were set to zero for days when well drained due to insufficient flow on October 1-10 and 15, 2010 and Sept 5, 2011. One 15 min value was missed on Sept 30, 2011 and filled in using trend in before and after gage heights without loss of accuracy.
Datum Corrections.--	Levels were last run on September 1, 2011. No correction was necessary at that time. The RP elevation was found to be within, however levels loop was incomplete.
Rating.--	The control is a rock and concrete dam eleven feet below the gage. Rating Number 10 was developed from WY 2010 measurements and is defined by measurements from 0.01 to 62 cfs. Eight measurements (909 – 916) were made this water year ranging in discharge from 0.09 to 21 cfs. The peak flow of 30.0 cfs occurred at 2230 on May 20, 2011 at a gage height of 1.30 ft with a shift of -0.04 feet.
Discharge.--	Shifting control method was used all year. Shifts are caused by accumulation of material on the control. Measurements showed unadjusted shifts ranging from -0.04 to 0.01 feet. Shifts were applied by time between measurements with consideration to stage. All measurements were given full weight. A gage height change due to moss cleaning on Sept 27 was applied to the shift found with Msmt 916 made that day after the moss cleaning.
Special Computations.--	Discharges for ice affected periods were estimated from adjacent periods of good record with consideration of temperature trends. Discharges for the October 24 to 29 period were estimated from adjacent periods of good data with a hand proration across the period.
Remarks.--	Record is rated good, except for periods of ice effect, which are estimated and poor. The period November 25, 2010 to March 9, 2011 is rated fair due to possible ice effect. October 24 to 29 is also estimated and poor due to large debris pile on control. Station maintained and record developed by Patrick Tyler.
Recommendations.--	High water measurements should be pursued, as most of the year's flow will occur during the peak event periods. Channel conditions should be noted with every visit, as this gage is susceptible to filling in with gravel and cobble. A cleanout is recommended every 3 to 5 years. Levels should be run again this coming water year. PZF on the control should be verified, and the MSL elevation from the temporary RM established by the 2008 pipeline contractor should be transferred to one of our RM's.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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06730300 COAL CREEK NEAR PLAINVIEW

RATING TABLE.-- COCREPCO10 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

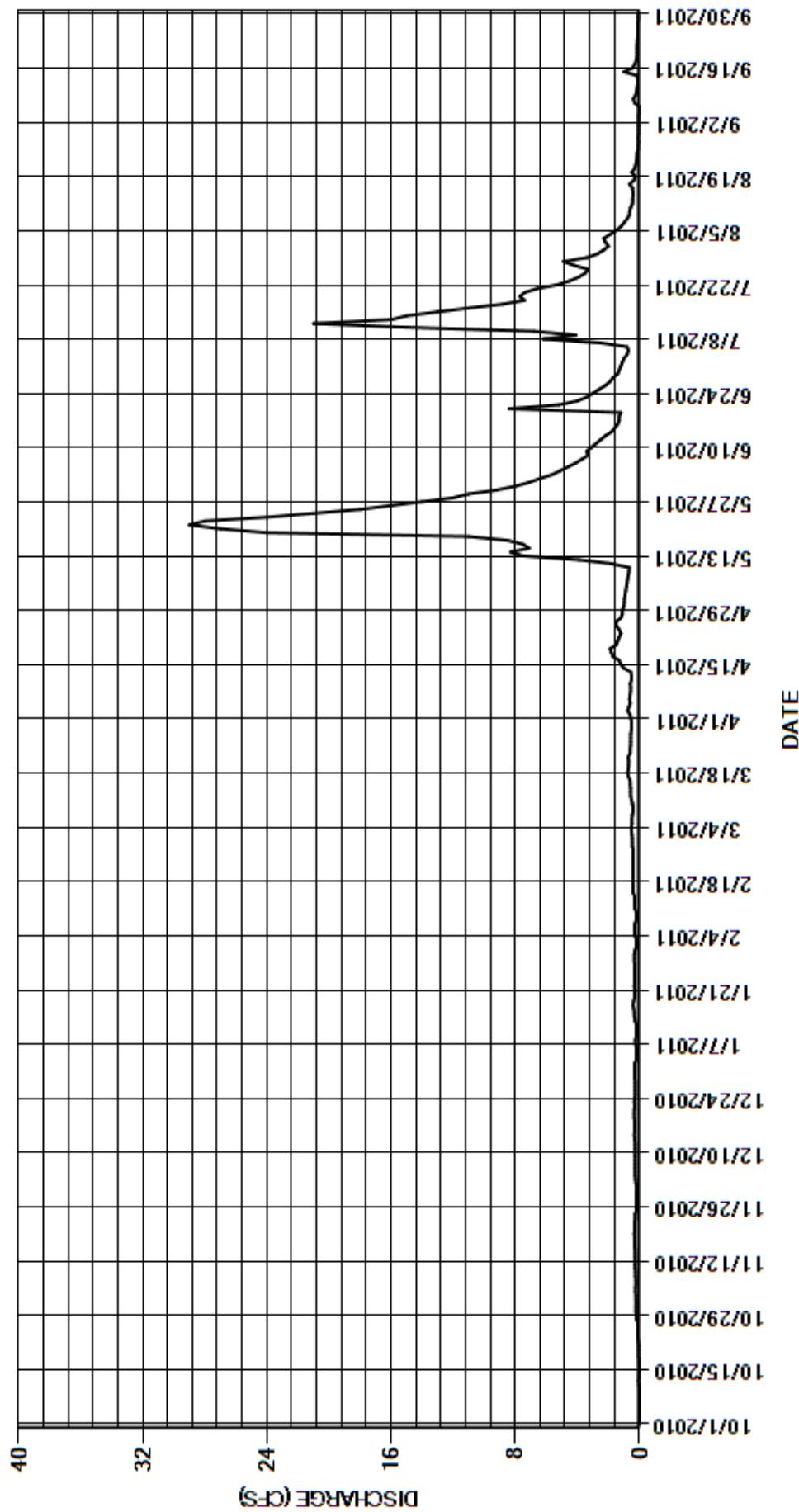
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.22	0.19	e0.30	e0.20	0.46	0.55	0.98	7.1	1.2	2.0	0.05
2	0.00	0.23	0.23	e0.30	e0.20	0.48	0.60	0.97	6.4	1.1	2.2	0.05
3	0.00	0.24	0.26	e0.20	e0.20	0.52	0.76	0.92	5.6	0.99	2.3	0.04
4	0.00	0.25	0.28	e0.20	e0.30	0.52	0.67	0.88	5.1	0.80	1.9	0.04
5	0.00	0.25	0.27	e0.20	e0.30	0.48	0.59	0.84	4.6	0.70	1.5	0.02
6	0.00	0.24	0.29	e0.20	e0.30	0.48	0.64	0.80	4.1	0.80	1.2	0.03
7	0.00	0.24	0.28	0.25	e0.30	0.47	0.60	0.76	3.7	2.5	1.0	0.31
8	0.00	0.25	0.29	0.26	e0.20	e0.40	0.57	0.72	3.3	6.2	0.80	0.39
9	0.00	0.26	0.28	e0.20	e0.20	e0.40	0.56	0.67	3.4	4.1	0.65	0.24
10	0.00	0.28	0.28	e0.20	e0.20	0.45	0.59	0.65	3.1	6.8	0.63	0.18
11	0.02	0.29	0.28	e0.20	e0.30	0.51	0.52	1.8	2.8	15	0.56	0.14
12	0.05	0.27	0.28	e0.20	e0.30	0.57	0.51	3.9	2.5	21	0.45	0.11
13	0.03	0.28	0.30	0.28	e0.30	0.58	0.55	7.5	2.2	16	0.44	0.11
14	0.02	0.28	0.32	0.32	e0.30	0.57	1.0	8.3	1.8	15	0.41	0.15
15	0.01	0.29	0.32	0.33	e0.40	0.59	1.2	7.1	1.6	13	0.42	1.0
16	0.02	0.31	0.31	0.36	e0.40	0.60	1.3	7.5	1.4	11	0.45	0.44
17	0.03	0.30	0.31	0.41	e0.40	0.71	1.7	8.5	1.3	8.8	0.64	0.29
18	0.04	0.31	e0.30	0.37	e0.40	0.75	1.8	11	1.3	7.4	0.35	0.21
19	0.04	0.33	0.34	e0.30	e0.40	0.71	1.9	24	1.2	7.7	0.27	0.16
20	0.04	0.30	0.35	e0.30	e0.40	0.70	1.5	27	8.4	7.4	0.49	0.15
21	0.04	0.32	0.33	0.31	e0.40	0.68	1.4	29	5.2	6.6	0.32	0.16
22	0.07	0.31	0.31	0.33	e0.40	0.73	1.3	28	4.0	5.3	0.24	0.15
23	0.09	0.27	0.33	e0.30	e0.40	0.60	1.2	24	3.4	4.5	0.19	0.13
24	e0.10	0.28	0.31	e0.30	e0.40	0.60	1.3	21	3.0	3.9	0.16	0.11
25	e0.10	e0.20	0.27	e0.30	e0.40	0.57	1.5	18	2.6	3.5	0.15	0.10
26	e0.10	e0.20	0.28	0.32	e0.40	0.56	1.5	16	2.2	3.3	0.08	0.09
27	e0.10	0.20	0.28	0.31	0.45	0.55	1.2	14	1.9	4.2	0.07	0.09
28	e0.20	0.22	0.28	0.32	0.45	0.56	1.1	12	1.7	4.9	0.06	0.09
29	e0.20	0.21	0.30	0.32	---	0.52	1.1	11	1.4	3.4	0.08	0.08
30	0.24	e0.20	e0.30	0.33	---	0.51	1.0	9.2	1.3	2.7	0.06	0.08
31	0.23	---	e0.30	e0.30	---	0.50	---	8.0	---	2.3	0.06	---
TOTAL	1.77	7.83	9.05	8.82	9.30	17.33	30.71	304.99	97.6	192.09	20.13	5.19
MEAN	0.057	0.26	0.29	0.28	0.33	0.56	1.02	9.84	3.25	6.20	0.65	0.17
AC-FT	3.5	16	18	17	18	34	61	605	194	381	40	10
MAX	0.24	0.33	0.35	0.41	0.45	0.75	1.9	29	8.4	21	2.3	1.0
MIN	0.00	0.20	0.19	0.20	0.20	0.40	0.51	0.65	1.2	0.70	0.06	0.02
CAL YR	2010	TOTAL	2344.08	MEAN	6.42	MAX	75	MIN	0.00	AC-FT	4650	
WTR YR	2011	TOTAL	704.81	MEAN	1.93	MAX	29	MIN	0.00	AC-FT	1400	

MAX DISCH: 30 CFS AT 22:30 ON MAY 20,2011 GH 1.30 FT SHIFT -0.04 FT

MAX GH: 1.30 FT AT 22:30 ON MAY 20,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06730300 COAL CREEK NEAR PLAINVIEW
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06731000 SAINT VRAIN CREEK AT MOUTH NEAR PLATTEVILLE, CO
Water Year 2011

Location.--	Lat. N40°15'28.88"; Long. W104°52'47.16' (NAD83), Hydrologic Unit 10190005, Weld County, CO. Gage is located on the right bank of the channel 125 ft. downstream of Weld County Road 19.5, 1.3 mi. from the confluence with the South Platte River, 1 mi. north of the Fort Saint Vrain power plant and 4 mi. northwest of Platteville, CO.
Drainage Area and Period of Record.--	979 mi ² (USGS Colorado StreamStats utility). Daily values are available from February 24, 1927 to present.
Equipment.--	High data rate Sutron 8210 DCP and Sutron 8500 shaft encoder until November 3, 2010. Equipment upgraded to digital incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink2 Data Collection Platform (DCP) on that date. A Steven's Type A continuous graphic water-stage recorder is also located in the 54-inch metal pipe shelter and well. The well is connected to the channel via two 2-inch intakes equipped with flushing provisions. The primary reference is an electric tape gage located inside the shelter. A staff gage was placed near the shelter but is largely unusable.
Hydrologic Conditions.--	Gage is below the confluence of the Saint Vrain Creek and Boulder Creek. Flows are heavily regulated upstream by numerous diversions from and deliveries to the creek including transbasin delivers via the Colorado-Big Thompson (C-BT) project. Channel control at all stages, substrate is composed primarily of sands and clays and is subject to fill and scour. The upstream bridge affects flows at all stages and has fostered the development of a sand bar at the gage location.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data and chart record as backup. Instrument calibration was maintained by twenty-eight visits to the gage. Three instrument corrections ranging from -0.01 to +0.01 ft were required and applied to the record as defined by visits made to the gage. One flush correction of +0.07 ft occurred this year. It was applied back to the last inflection point prior to the flush correction. The record is complete and reliable except for: November 30, December 31, 2010 and January 1-5, 10-15, 31 through February 12, 2011 when the stage-discharge relation was affected by ice.
	Missing gage-height values occurring on October 22, November 1-3, 2010, May 19 and July 27, 2011 were filled in with logged DCP and chart record without loss of accuracy.
Datum Corrections.--	Levels were run on August 25, 2011 using RM3 as base. The ETG index elevation was found to be 0.012 ft. low. No corrections were made to the index or the gage-heights of measurements.
Rating.--	Channel control at all stages. Rating SVCPLACO30 was used all year. Dated June 21, 2010, SVCPLACO30 is defined by measurements from 33 to 2180 cfs. The channel has well defined banks. Primarily composed of sands, silts and clays; the channel subject to considerable fill and scour. The bridge above the gage straightens flow and causes sand bars at the gage and downstream from the center pier. Twenty-three discharge measurements (Nos. 958-980) were made during the year ranging in discharge from 103 to 1900 cfs covering the range in stage experienced this year well except for low daily flows occurring on November 26-28, 30-December 3, 11, 13, 17-19, 26-27, 31, 2010, January 1-2, 11-13, 21-February 3, March 6-7, 10-13, 17-27, 29-April 13, and May 3-9, 2011. The peak flow of 2180 cfs occurred at 0045 July 15, 2011 at a gage-height of 7.61 ft. with a of +0.11 ft. The peak exceeded high flow Measurement No. 973 made July 15, 2011 by 280 cfs. and 0.25 ft. of stage.
Discharge.--	Shifting control method was used for all periods of open water. Shifts are caused by fill and scour of the channel and are typically event driven. The left bank across from the gage is continually being eroded by high flows. Shifts were prorated by time with consideration given to change in stage. Open water measurements showed shifts varying from 0.00 to +0.27 ft. All were given full weight except for Nos. 966, 970, 975-977 which were discounted up to ±1.59% to smooth shift distributions.
Special Computations.--	Discharge for ice affected periods was estimated on a basis of adjacent good record, partial day good record, fluctuations in stage during days of estimation and temperature trends recorded at the gage.
Remarks.--	The record is good, except for periods of ice affect which are estimated and poor. April 3, 6-8 are fair due to a lack of confirming low flow measurements. Station maintained by Division One Hydrographic Staff and record developed by Patrick Tyler.
Recommendations.--	More measurements would be desirable especially at higher stages (above 3.00 feet of stage). The continuous growth of the sand-bar just below the bridge has detrimental affects to high-flow measurements. Steps should be taken to ensure trees do not become established on the sand-bar. Identify the high water controlling feature. More visits would be helpful in the winter to evaluate ice conditions.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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06731000 SAINT VRAIN CREEK AT MOUTH NEAR PLATTEVILLE, CO

RATING TABLE-- SVCPLACO030 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

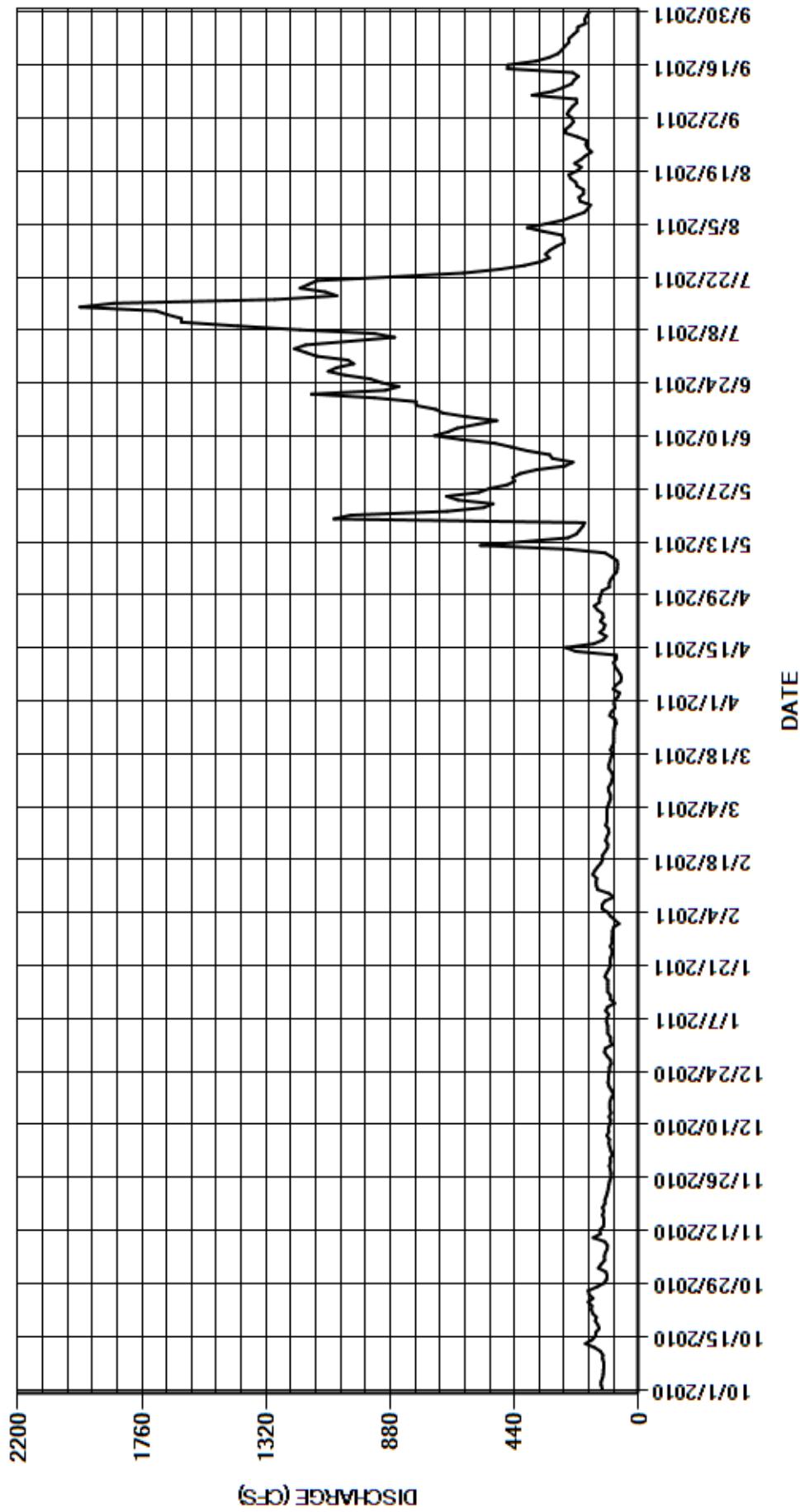
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	129	117	101	e100	e70	113	87	104	363	1140	266	231
2	133	143	93	e100	e85	113	74	105	261	1180	271	237
3	133	133	99	e110	e100	113	68	99	233	1220	337	254
4	128	121	103	e110	e110	110	91	90	306	1180	395	246
5	126	122	106	e110	e130	105	82	78	316	1020	328	235
6	125	119	104	114	e130	100	65	76	394	865	267	220
7	124	112	113	113	e120	100	61	75	451	935	232	221
8	124	111	106	106	e90	106	66	77	510	1200	194	378
9	128	121	107	117	e105	108	75	97	629	1420	180	306
10	127	161	103	e110	e145	99	84	119	724	1620	171	269
11	136	136	99	e85	e150	95	89	251	676	1620	208	238
12	157	138	105	e100	151	91	80	561	643	1670	212	229
13	189	125	98	e100	149	96	79	408	573	1710	195	214
14	166	124	102	e110	163	105	223	251	503	1980	195	234
15	153	124	102	e110	156	106	259	221	609	1860	219	465
16	152	128	102	110	146	102	159	210	694	1290	223	464
17	140	124	97	109	134	98	127	199	720	1070	241	365
18	145	128	90	120	128	93	115	192	789	1110	248	317
19	154	120	97	114	129	100	138	1080	789	1200	218	286
20	150	120	105	106	120	93	124	1020	936	1170	204	272
21	163	115	109	100	111	88	120	679	1160	1140	227	261
22	168	111	107	102	110	88	136	549	898	873	205	247
23	166	108	107	100	117	88	126	516	850	620	189	247
24	179	106	104	95	113	88	128	640	911	493	167	232
25	162	103	104	94	106	86	147	681	950	405	181	217
26	176	98	98	101	107	80	158	567	1040	348	188	216
27	179	98	100	94	117	83	139	531	1100	317	183	188
28	148	101	112	95	113	103	139	467	1070	330	217	192
29	123	104	121	93	---	97	134	440	1010	316	259	185
30	114	e100	119	93	---	84	130	446	1030	293	259	175
31	112	---	e95	e90	---	87	---	420	---	265	242	---
TOTAL	4509	3571	3208	3211	3405	3018	3503	11249	21138	31860	7121	7841
MEAN	145	119	103	104	122	97.4	117	363	705	1028	230	261
AC-FT	8940	7080	6360	6370	6750	5990	6950	22310	41930	63190	14120	15550
MAX	189	161	121	120	163	113	259	1080	1160	1980	395	465
MIN	112	98	90	85	70	80	61	75	233	265	167	175
CAL YR	2010	TOTAL	102357	MEAN	280	MAX	2750	MIN	79	AC-FT	203000	
WTR YR	2011	TOTAL	103634	MEAN	284	MAX	1980	MIN	61	AC-FT	205600	

MAX DISCH: 2180 CFS AT 00:45 ON JUL 15,2011 GH 7.61 FT SHIFT 0.11 FT

MAX GH: 7.61 FT AT 00:45 ON JUL 15,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06731000 SAINT VRAIN CREEK AT MOUTH NEAR PLATTEVILLE, CO
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
WIND RIVER NEAR ESTES PARK
Water Year 2011

Location.--	Lat. N40° 19' 37", Long. W105° 34' 52" (NAD83). Gage is located on the left side of a 4-foot Parshall flume located upstream of the Alva B. Adam's tunnel afterbay; 1,330 ft. west of the ADATUNCO gage shelter and 5 mi. SW of the Town of Estes Park Visitors Center.
Drainage Area and Period of Record.--	4.35 sqmi (from the USGS's Colorado StreamStats utility). Daily values are available from May 17, 1950 to present.
Equipment.--	Sutron SDR-0001-4 shaft encoder connected to a satellite monitored Sutron SatLink2 data collection platform (DCP) in a 4-foot by 4-foot wooden shelter overtop a 36-inch corrugated metal pipe stilling well at a 4-foot steel Parshall flume. An electric tape gage (ETG) located on the instrument shelf is the primary reference and a supplemental staff gage is located at the flume's left Ha location. The station is maintained in cooperation with the United State Bureau of Reclamation (USBR) and the Colorado Division of Water Resources (DWR) to determine east slope diversions in to the Colorado Big Thompson (C-BT) system from Wind River.
Hydrologic Conditions.--	<p>Drainage area consisting of forested lands of varying topography within the boundaries of Rocky Mountain Nation Park. A small diversion is located upstream of the gage diverting approximately 300 Acre Feet (AF) of domestic water a year.</p> <p>The gage is used to compute the amount of native East Slope (Wind River) water being diverted or "skimmed" into the Colorado-Big Thompson system at Adams Tunnel. See Special Computation section below for complete description. The USBR does not divert flow into the C-BT system if the native flow in Wind River is 2 cubic feet per second (cfs) or less. Skimming operations of Wind River occurred from May 23, 2011 (1000) to August 1, 2011 (1315).</p>
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data and 5-minute logged SDR data as backup. Frequent visits by USBR and DWR personnel showed good agreement between the sensor and base gage. The record is complete and reliable except for the following periods: November 14, 2010 when the stage-discharge relationship was affected by ice on the control; November 24-27, 2010, when the stilling well was frozen; and November 28, 2010 and April 28, 2011, which are partial day records corresponding to shutdown and startup of the gage. Missing satellite values on June 27, 2011 from 1515 to 1630 and August 29, 2011 from 12:15 to 14:00 during satellite monitoring equipment upgrades were interpolated from adjacent good record. This is a partial year record and the gage is not maintained during winter months. No gage-height record is available from November 29, 2010 through April 27, 2011.
Datum Corrections.--	Levels were last run on October 24, 2011 using the average flume crest (R.M.0) as base. The inside gage was found to be reading within allowable tolerances. The supplemental staff gage was not shot.
Rating.--	The control is a 4-foot metal Parshall flume. A standard 4-foot Parshall flume rating (STD04FTPF) was continued in used for all of WY2011. Three measurements (Nos. 129-131) were made during the year, ranging in discharge from 4.07 to 15.7 cfs. The peak flow of 20.5 cfs occurred at 0400 on June 20, 2011 at a gage-height of 1.16 ft with a shift of 0.01 ft. It exceeded measurement No. 131 made on June 8, 2011 by 4.80 cfs and 0.18 feet of stage respectively.
Discharge.--	Shifting control method was used for all periods of record. Shifts were applied by time proration. WY11 measurements showed shifts varying from 0.00 to 0.01 ft. All measurements were given full weight except for No. 130 which was adjusted -2% to smooth the shift distribution.
Special Computations.--	<p>Discharge for November 14, 2010 was estimated from presumed good record recorded at the WINBYPSCO gage and discharges for November 24-28, 2010 were estimated from adjacent record and temperature trends recorded at the Big Thompson River Above Lake Estes (BTABESCO) gage 4.9 miles away.</p> <p>The WINDESCO gage is used in the ADANETCO computation process to determine the amount of Wind River water that was "skimmed" into the C-BT system. This is done by subtracting the amount of water recorded at the WINDESCO from the amount of water recorded at the Wind River Below Adams Tunnel (WINBYPSCO) gage. The difference is then subtracted from the Alva B. Adam's Tunnel at East Portal (ADATUNCO) record to determine the ADANETCO (Alva B. Adam's Tunnel New (West Slope)) delivery during skimming periods. This computation is not performed when skimming is not occurring. Differences in discharge values between the WINDESCO and WINBYPSCO records occurring outside the "skim" period are presumed to be due to either in part or in aggregate, slight drainage accruing to the stream from the ADATUNCO gage basin, or slight daily rounding differences and transit time allowances. Skimming operations occurred between May 23, 2011 (1000) and August 1, 2010 (1315) diverting 1256 acre feet of water into the C-BT system for power generation purposes.</p>
Remarks.--	This is a partial year record. Period of record for Water Year 2011 is October 1 to November 28, 2010 and April 28 to September 30, 2010. The record is good, except for periods of ice affected record and partial day records, which are estimated and poor. Station was closed for winter for the period; November 29, 2010 through April 27, 2011 where no record was maintained. Station maintained by USBR and DWR staff. Record developed by Russell V. Stroud.
Recommendations.--	More discharge measurements should be made as flows permit. ETG tape should be replaced as it has several splices in its medial section. Levels should be run again following ETG tape replacement.

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WIND RIVER NEAR ESTES PARK

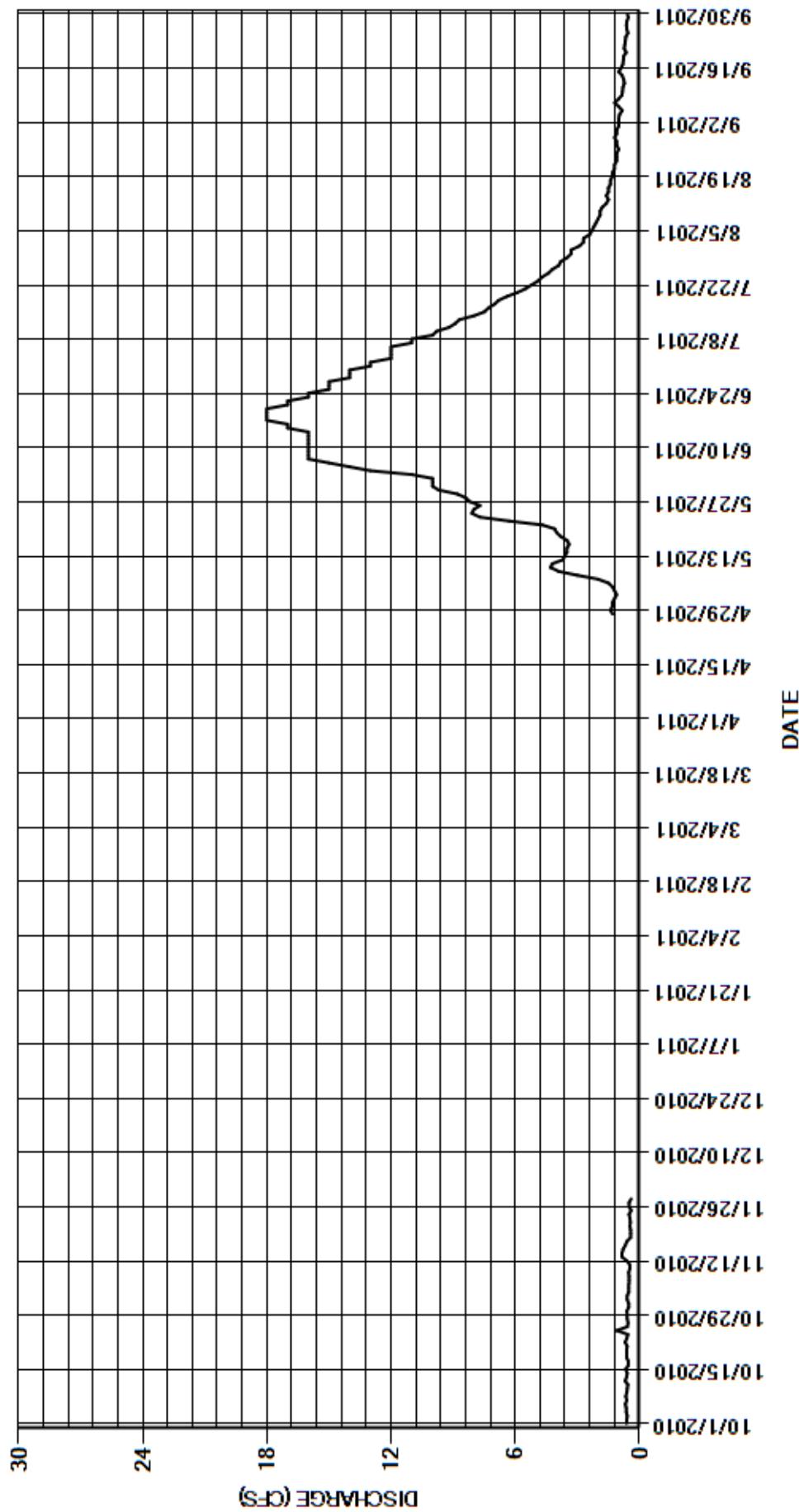
RATING TABLE.-- STD04FTP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011												
DAY	MEAN VALUES											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.63	0.52	---	---	---	---	---	1.3	10	13	2.9	1.0
2	0.61	0.59	---	---	---	---	---	1.2	10	13	2.7	1.0
3	0.59	0.59	---	---	---	---	---	1.1	11	12	2.7	1.0
4	0.64	0.51	---	---	---	---	---	1.2	13	12	2.4	0.96
5	0.64	0.51	---	---	---	---	---	1.3	14	12	2.3	0.83
6	0.68	0.51	---	---	---	---	---	1.5	15	12	2.2	1.0
7	0.61	0.50	---	---	---	---	---	2.0	16	11	2.1	1.2
8	0.66	0.50	---	---	---	---	---	3.0	16	11	2.0	1.0
9	0.61	0.52	---	---	---	---	---	3.9	16	10	1.9	0.84
10	0.59	0.46	---	---	---	---	---	4.3	16	9.8	1.9	0.82
11	0.56	0.47	---	---	---	---	---	4.2	16	9.2	1.8	0.80
12	0.69	0.61	---	---	---	---	---	3.7	16	8.9	1.6	0.73
13	0.62	0.84	---	---	---	---	---	3.6	16	8.7	1.5	0.76
14	0.59	e0.84	---	---	---	---	---	3.5	16	8.0	1.6	0.83
15	0.67	0.79	---	---	---	---	---	3.5	17	7.5	1.5	1.0
16	0.54	0.68	---	---	---	---	---	3.4	17	7.3	1.5	0.88
17	0.53	0.61	---	---	---	---	---	3.5	18	7.0	1.4	0.80
18	0.62	0.43	---	---	---	---	---	3.8	18	6.8	1.4	0.78
19	0.62	0.43	---	---	---	---	---	4.0	18	6.4	1.3	0.76
20	0.61	0.43	---	---	---	---	---	4.1	18	5.9	1.3	0.64
21	0.60	0.46	---	---	---	---	---	4.7	17	5.5	1.2	0.74
22	0.69	0.44	---	---	---	---	---	6.3	17	5.2	1.2	0.71
23	0.61	0.46	---	---	---	---	---	7.7	16	4.9	1.1	0.68
24	0.56	e0.50	---	---	---	---	---	8.1	16	4.7	1.1	0.66
25	1.1	e0.40	---	---	---	---	---	8.0	15	4.4	1.1	0.56
26	0.58	e0.50	---	---	---	---	---	7.7	15	4.2	1.0	0.61
27	0.55	e0.50	---	---	---	---	---	8.2	15	3.9	1.1	0.63
28	0.59	e0.40	---	---	---	---	e1.3	8.4	14	3.8	1.1	0.61
29	0.59	---	---	---	---	---	1.4	8.8	14	3.5	1.2	0.54
30	0.61	---	---	---	---	---	1.3	9.7	14	3.3	1.1	0.58
31	0.52	---	---	---	---	---	---	10	---	3.3	1.1	---
TOTAL	19.31	15.00	---	---	---	---	4.0	145.7	460	238.2	50.3	23.95
MEAN	0.62	0.54	---	---	---	---	1.33	4.70	15.3	7.68	1.62	0.80
AC-FT	38	30	---	---	---	---	7.9	289	912	472	100	48
MAX	1.1	0.84	---	---	---	---	1.4	10	18	13	2.9	1.2
MIN	0.52	0.40	---	---	---	---	1.3	1.1	10	3.3	1.0	0.54
CAL YR	2010	TOTAL	745.41	MEAN	3.34	MAX	16	MIN	0.40	AC-FT	1480 (PARTIAL YEAR RECORD)	
WTR YR	2011	TOTAL	956.46	MEAN	4.45	MAX	18	MIN	0.40	AC-FT	1900 (PARTIAL YEAR RECORD)	

MAX DISCH: 20.5 CFS AT 04:00 ON JUN 20,2011 GH 1.16 FT SHIFT 0.01 FT
MAX GH: 1.16 FT AT 04:00 ON JUN 20,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

WIND RIVER NEAR ESTES PARK
WY2011 HYDROGRAPH



PLATTE RIVER BASIN

WIND RIVER BYPASS

Water Year 2011

Location.--	Lat. N40° 19' 41.47", Long. W105° 34' 35.86" (NAD83). Gage is located on the left side of a 3-foot Cipolletti weir below the Alva B. Adams Tunnel East Portal afterbay approximately 4.9 mi. southwest of the Town of Estes Park Visitors Center.
Drainage Area and Period of Record.--	4.35 sq mi (from the USGS's Colorado StreamStats utility). Daily values are available from October 1, 2000 to present.
Equipment.--	Sutron SDR-0001-1 shaft encoder in a steel corrugated metal pipe (CMP) shelter and stilling well at a 3-foot Cipolletti weir. A metal drop tape and nonadjustable reference point serve as the primary reference; a supplemental staff gage is placed in the stilling pool adjacent to the shelter. A buried data line connects the shaft encoder to a Sutron SatLink2 data collection platform at the Alva B. Adam's Tunnel at East Portal (ADATUNCO) gage shelter. The gage is operated in cooperation with the United States Bureau of Reclamation (USBR) and the Colorado Division of Water Resources (DWR) as a component of the Colorado Big Thompson (C-BT) system.
Hydrologic Conditions.--	Drainage area consisting of forested lands of varying topography within the boundaries of Rocky Mountain Nation Park. A small diversion is located upstream of the gage diverting approximately 300 Acre Feet (AF) of domestic water a year. Alva B. The Adam's tunnel afterbay stilling reservoir is also located upstream of the gage. The gage is used to compute the amount of native East Slope (Wind River) water being diverted or "skimmed" into the Colorado-Big Thompson system at Adams Tunnel. See Special Computations section below for complete description. The USBR does not divert flow into the C-BT system if the native flow in Wind River is 2 cfs or less. Adams Tunnel can also release water to the Wind River Below Adams Tunnel channel as required for maintenance or safety concerns. The ADATUNCO stilling basin is equipped with a head gate and spillway; which, when in use, places water upstream of the WINBYPSCO control structure.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data and 5-minute logged SDR data as backup. Frequent visits by DWR personnel showed good agreement between the sensor and base gage. The record is complete and reliable except for the following periods: November 22-23, 2010, when the stage-discharge relationship was affected by ice on the control; November 24-27, 2010, when the stilling well was frozen; and November 28, 2010 and April 28, 2011, which are partial day records corresponding to shutdown and startup of the gage. Missing satellite values on June 27, 2011 from 1215 to 1530 during satellite monitoring equipment upgrade were filled in with logged SDR values without loss of accuracy. The SDR logged a peak stage value of 0.85 ft. on May 23, 2011 (0945) replaced the logged satellite value of 0.78 ft. The peak event corresponds with the USBR's starting of skimming operations. This is a partial year record and the gage was not maintained during the period from November 29, 2010 through April 27, 2011.
Datum Corrections.--	Levels were last run on October 24, 2011 using the average weir crest (R.M.O) as base. The inside gage was found to be reading 0.008 ft. high and was corrected to datum. A -0.01 ft. correction was applied to gage-heights of measurements and the gage-height record from April 28, 2011 to October 24, 2011. The staff gage was found to be 0.092 ft. low but was not corrected in lieu of impending winter conditions and subsequent rerunning of levels next spring.
Rating.--	The control is a 3-foot Cipolletti weir. A standard 3-foot Cipolletti weir rating (STD03FTCIP) was continued in use for all of WY2011. Three measurements (Nos. 14-16) were made during the year, ranging in discharge from 2.02 to 4.00 cfs. The peak flow of 7.92 cfs occurred at 0945 on May 23, 2011 at a gage-height of 0.84 ft. with a shift of 0.01 ft. It exceeded measurement No. 14 made on May 19, 2011 by 3.78 cfs and 0.32 feet in stage respectively.
Discharge.--	Shifting control method was used for the period of record this year. Shifts were applied as defined by measurements and distributed by time. Current water year measurements show shifts varying between +0.01 and -0.01 feet. All measurements were given full weight.
Special Computations.--	Discharges for November 22 and 23, 2011 were estimated from presumed good record recorded at the WINDESCO gage. Discharge from November 24-28, 2010 was estimated from adjacent record and temperature trends recorded at the Big Thompson River Above Lake Estes (BTABESCO) gage. The WINBYPSCO gage is used in the ADANETCO computation process to determine the amount of Wind River water that was "skimmed" into the C-BT system. This is done by subtracting the amount of water recorded at the Wind River Above Estes Park (WINDESCO) from the amount of water recorded at the WINBYPSCO gage. The difference is then subtracted from the Alva B. Adam's Tunnel at East Portal (ADATUNCO) record to determine the ADANETCO (Alva B. Adam's Tunnel New (West Slope) delivery during skimming periods. This computation is not performed when skimming is not occurring. Differences in discharge values between the WINDESCO and WINBYPSCO records occurring outside the "skim" period are presumed to be due to either in part or in aggregate, slight drainage accruing to the stream from the ADATUNCO gage basin, or slight daily rounding differences and transit time allowances. Skimming operations occurred between May 23, 2011 (1000) and August 1, 2010 (1315) diverting 1256 acre feet of water into the C-BT system for power generation purposes.
Remarks.--	This is a partial year record. Period of record for Water Year 2011 is October 1 to November 28, 2010 and April 28 to September 30, 2010. The record is good, except for periods of ice affected record and partial day record, which are estimated and poor. Station maintained by USBR and DWR staff. Record developed by Russell V. Stroud.
Recommendations.--	Levels should be run in the spring to monitor instability from frost heaving. Careful examination of skim balance should be made on real time basis. Photographs of the gage, control and channel should be taken to update the Station Description.

STATE OF COLORADO
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WIND RIVER BYPASS

RATING TABLE-- STD03FTCIP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

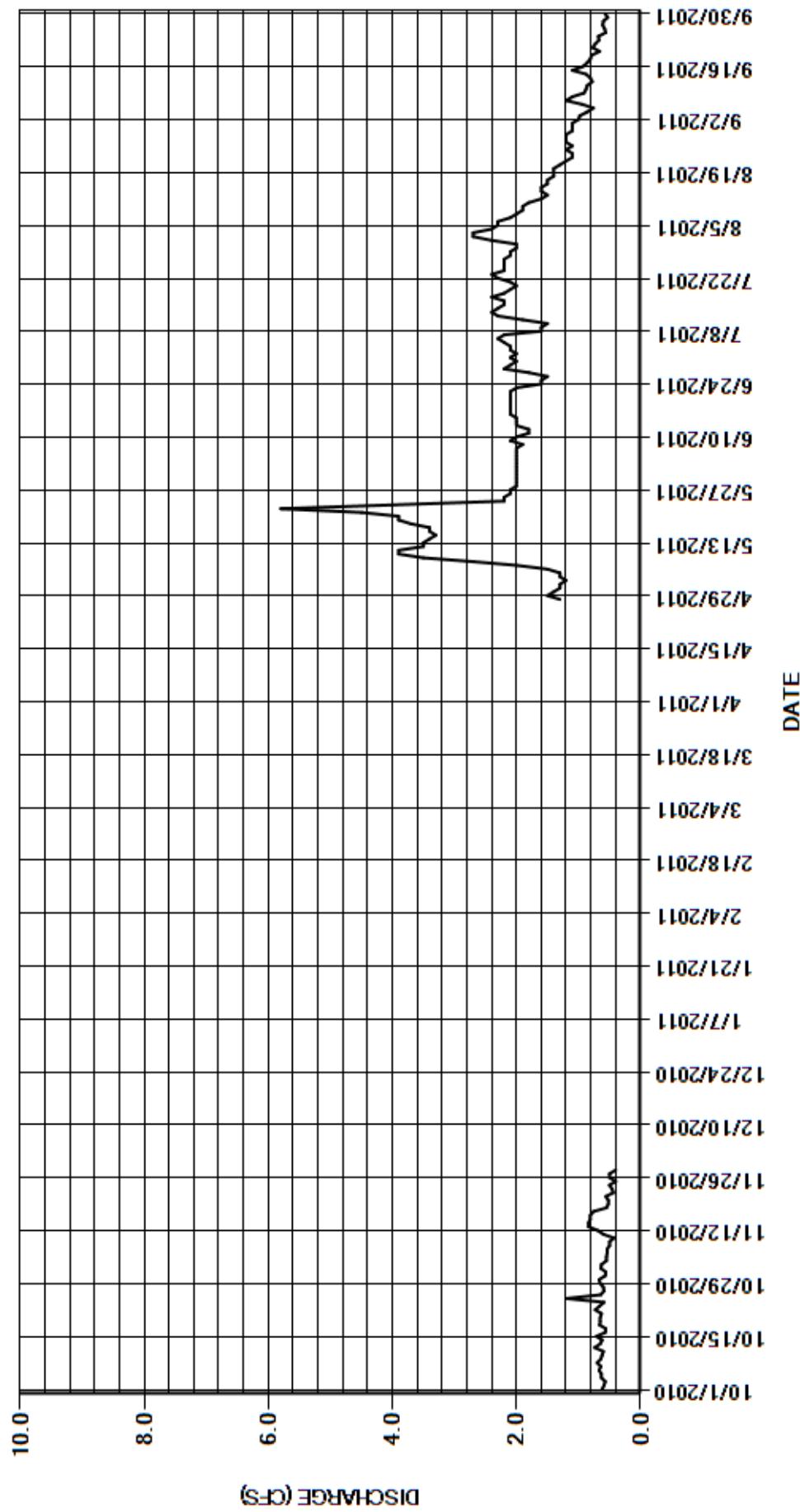
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.62	0.56	---	---	---	---	---	1.3	2.0	2.1	2.4	1.1
2	0.59	0.64	---	---	---	---	---	1.3	2.0	2.0	2.7	1.0
3	0.57	0.63	---	---	---	---	---	1.2	2.0	2.1	2.7	0.98
4	0.63	0.55	---	---	---	---	---	1.3	2.0	2.1	2.4	0.86
5	0.63	0.55	---	---	---	---	---	1.3	2.0	2.2	2.3	0.76
6	0.67	0.54	---	---	---	---	---	1.5	2.0	2.3	2.3	0.94
7	0.64	0.54	---	---	---	---	---	2.0	2.0	2.2	2.1	1.2
8	0.70	0.50	---	---	---	---	---	2.7	1.9	1.6	2.0	1.1
9	0.64	0.50	---	---	---	---	---	3.5	2.1	1.6	1.9	0.91
10	0.62	0.43	---	---	---	---	---	3.9	2.0	1.5	1.9	0.88
11	0.60	0.60	---	---	---	---	---	3.9	1.8	1.9	1.8	0.86
12	0.74	0.69	---	---	---	---	---	3.5	1.8	2.3	1.6	0.78
13	0.65	0.84	---	---	---	---	---	3.5	2.0	2.4	1.5	0.81
14	0.62	0.84	---	---	---	---	---	3.4	2.0	2.3	1.6	0.88
15	0.71	0.81	---	---	---	---	---	3.3	2.0	2.2	1.6	1.1
16	0.57	0.81	---	---	---	---	---	3.4	2.1	2.2	1.5	0.93
17	0.56	0.76	---	---	---	---	---	3.4	2.1	2.4	1.5	0.86
18	0.66	0.55	---	---	---	---	---	3.7	2.1	2.2	1.4	0.81
19	0.65	0.52	---	---	---	---	---	3.9	2.1	2.1	1.4	0.79
20	0.65	0.52	---	---	---	---	---	3.9	2.1	2.0	1.4	0.66
21	0.63	0.56	---	---	---	---	---	4.5	2.1	2.1	1.3	0.77
22	0.73	e0.44	---	---	---	---	---	5.8	2.1	2.3	1.2	0.73
23	0.66	e0.46	---	---	---	---	---	4.0	2.0	2.4	1.1	0.67
24	0.59	e0.50	---	---	---	---	---	2.2	1.6	2.2	1.1	0.68
25	1.2	e0.40	---	---	---	---	---	2.2	1.6	2.2	1.2	0.56
26	0.64	e0.50	---	---	---	---	---	2.1	1.5	2.2	1.1	0.58
27	0.59	e0.50	---	---	---	---	---	2.1	1.8	2.2	1.2	0.61
28	0.60	e0.40	---	---	---	---	e1.3	2.0	2.2	2.1	1.2	0.60
29	0.65	---	---	---	---	---	---	1.5	2.0	2.1	1.2	0.53
30	0.67	---	---	---	---	---	---	1.4	2.0	2.0	1.1	0.57
31	0.57	---	---	---	---	---	---	2.0	---	2.0	1.1	---
TOTAL	20.25	16.14	---	---	---	---	4.2	86.8	59.1	65.5	50.8	24.51
MEAN	0.65	0.58	---	---	---	---	1.40	2.80	1.97	2.11	1.64	0.82
AC-FT	40	32	---	---	---	---	8.3	172	117	130	101	49
MAX	1.2	0.84	---	---	---	---	1.5	5.8	2.2	2.4	2.7	1.2
MIN	0.56	0.40	---	---	---	---	1.3	1.2	1.5	1.5	1.1	0.53
CAL YR	2010	TOTAL	326.54	MEAN	1.46	MAX	2.7	MIN	0.40	AC-FT	648	(PARTIAL YEAR RECORD)
WTR YR	2011	TOTAL	327.30	MEAN	1.52	MAX	5.8	MIN	0.40	AC-FT	649	(PARTIAL YEAR RECORD)

MAX DISCH: 7.92 CFS AT 09:45 ON MAY 23,2011 GH 0.84 FT SHIFT 0.01 FT

MAX GH: 0.84 FT AT 09:45 ON MAY 23,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

WIND RIVER BYPASS
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06733000 BIG THOMPSON RIVER ABOVE LAKE ESTES
Water Year 2011

Location.--	Lat. N. $40^{\circ}22'42''$, Long. W. $105^{\circ}30'50''$ (NAD 83), Larimer County Hydrologic Unit 10190006. . Gage is located on the right bank 630 ft. downstream from the Hwy 36 bridge, 2,400 ft. upstream from Lake Estes adjacent from the Estes Park Visitor's Center. Gage is also known as Big Thompson River at Estes Park, CO
Drainage Area and Period of Record.--	137 mi ² (USGS Colorado StreamStats utility). Daily values are available from October 1, 1946 to present.
Equipment.--	Digital incremental Surron SDR-0001-4 shaft encoder, tipping bucket rain gage and temperature sensor connected to a Surron SatLink2 Data Collection Platform (DCP) in a four ft. by four ft. concrete shelter and stilling well at a 15-ft. Parshall flume with ogee crested overflow bays flanking the flume. The well is attached to the channel via one two-inch and three three-inch valved inlets, one inlet connects the well to the flume at its Ha location and three inlets connect the channel to the well at the shelter location. The primary reference is an electric tape gage located in the shelter with two supplemental outside staff gates. One at the Ha location of the flume and the other is located on the stream ward side of the shelter. The second staff is utilized when the upstream inlets are active. The gage is maintained in cooperation of the United States Bureau of Reclamation and the Colorado Division of Water Resources.
Hydrologic Conditions.--	Drainage area mainly comprised of forested lands (Rocky Mountain National Park) of varying topography as well as the bulk of Estes Park, CO. There are no storage projects nor diversions of significant magnitude upstream of this site. The gage is susceptible to rapid increases in stage due to storm runoff events from hardened surfaces. Spring runoff displays strong diurnal characteristics associated with snowmelt, peaking early in the morning. The town of Estes Park placed several bank stabilization cross-vane boulder structures in the channel at an unknown date from January-April, 2008. The concept was to stabilize the left bank by diverting flow energy back to the center of the channel. However, the installation of the energy diversion structures was executed incorrectly causing flow energy to divert towards the left bank. This redirected flow energy pattern propagates through the flume. Gage-height readings at the Ha staff often read higher than the base gage. Moreover, at higher flows side-to-side velocity bias and stage stack-up can be seen across the flume's crest by visual inspection and current meter measurements.
Gage-Height Record.--	The primary record is 15-minute satellite data with 5-minute logged SDR data and 15-minute logged DCP data as backup. Instrument calibration was maintained by frequent visits to the site by USBR and DWR staff. Two instrument corrections of ± 0.01 ft. were made on December 9 and 29, 2010. They were applied to the record as defined by visits to the gage. Previous to May 18, 2011, the inlets directly connecting the channel to the well were closed unless the flume was in "overflow operation" meaning there was flow through the overflow bays (weirs). On May 18, 2011 the flash boards on the overflow bays were removed to increase overall conveyance of the structure. The upstream well inlets and upstream outside staff gage became primary at that time.
Datum Corrections.--	The record is complete and reliable except for: November 9 through 30 and December 18 through 29, 2010 when either the inlets were frozen or the stage-discharge relation was affected by ice; March 24, 2011 which is a partial day record; and sporadic periods from May 28 through July 22, 2011 when debris was caught on the flash board supports following flash board removal on May 18, 2011. USBR staff periodically removed and dislodged varying amounts of debris from the supporting structure during this period. Unfortunately, notations regarding the amount of material removed and resulting change in gage-height were not made following their efforts. Inspection of the hydrograph and tabular data was inconclusive in determining when material was either lodged or dislodged from the control. Missing values on May 18 and 19, 2011 were filled in with SDR values without loss of accuracy. Missing values occurring on June 27, 2011 during DCP upgrade activities were interpolated from adjacent good record.
Rating.--	The control is a 15-ft. Parshall flume with ogee crest overflow bays flanking the flume. Prior to May 18, 2011 the overflow bays were topped with flashboards. Rating BTABESCO09, in use from October 1, 1971 was continued to May 18, 2011 (11: 45). The rating is a standard 15-ft. Parshall flume rating to about 5.00 ft. in stage when flow begins go over the overflow bay flashboards. The upper portion of the rating was confirmed by measurements to 1220 cfs, made in 2003. Rating BTABESCO10 was developed in the 2011 Water Year and used from May 18, 2011 (1200) to September 30. It was developed following removal of the flashboards from the overflow bays on May 18, 2011 and the inlet reorientation from the Ha inlet location to the upstream weir pool location. The rating was developed using a Std. 15 Parshall flume rating from 0.00 ft to ~2.43 ft. with a theoretical water surface drawdown curve from the stilling well to the Ha location in the flume; and theoretical average weir flow for gage heights above 2.43 ft (using the Francis weir equation and the WES short crested weir equation) and Msmts. Nos. 640-647 made during WY11 (after May 18) ranging from 2.35 to 4.49 ft. of stage and 171 to 933 cfs, respectively. Twenty-one discharge measurements (Nos. 633 to 653) were made in the 2011 Water Year ranging from 20.9 to 1240 cfs. The peak discharge is not determined due to the debris accumulation conditions discussed above; however, the peak stage of 6.08 ft. occurred at 0230 on July 9, 2011.
Discharge.--	Shifting control method was used for all periods of open and unobstructed flow. Higher than normal approach velocities due to channel grade are present at the site and are suspected to cause positive shifting to the flume rating. Moreover, constant sand and gravel accumulation upstream of the flume are also suspected of causing positive shifting conditions as water is not allowed to "still" adequately before entering the flume. Shifts are also caused by accumulation of materials in the weir pool, algal growth in the flume and accumulation of debris on the flashboard supports. Shifts were applied by time proration with consideration of stage and events. Measurements showed unadjusted shifts ranging from -0.38 to 0.20 ft. Measurements Nos. 640, 647-648, 651-653 were adjusted from -2% to +2% to smooth shift distribution. Meas. Nos. 643 and 644 were made under poor conditions and not used.

Special Computations.--	Discharge for periods of frozen inlets, ice effect and backwater due to debris accumulation were taken from USBR computed inflow values. The USBR computes the native inflow to Lake Estes based on gaged outflows (BTBLES CO and OLYTUNCO) correlating the net outflow to reservoir elevation changes at Lake Estes. The computed flow is the summation of all sources of unaccounted-for water into Lake Estes, including local runoff.
	Note: The USBR requested that no winter measurements be performed in the flume due to concerns of damaging the newly placed concrete. As such, no measurements were made during ice conditions.
Remarks.--	The record is good, except for periods of ice affected gage-height record, partial day record and backwater, which are estimated using USBR computed inflows to Lake Estes and are considered fair. Station maintained by USBR and DWR staff and record developed by DWR staff. The flashboard supports were removed during the winter period of Water Year 2012 and this should mitigate backwater effects due to debris hanging up on these supports.

Recommendations.--	Continue efforts to find a cooperative solution to issues introduced by Estes Park's erosion control device including placement of a gradient control /energy dissipation structure upstream of the flume; and correctly designed and placed bank stabilization/protection structures. The new rating needs to be verified throughout the full range of flow. This should be much easier to do given removal of the flashboard supports.
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06733000 BIG THOMPSON RIVER ABOVE LAKE ESTES

RATING TABLE-- BTABESCO09 USED FROM 01-OCT-2010 TO 18-MAY-2011
BTABESCO10 USED FROM 18-MAY-2011 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	28	39	22	e24	e24	e24	31	59	e329	e1230	450	140
2	27	37	22	e33	e23	e25	35	56	e452	e1120	469	131
3	28	38	23	e32	e21	e23	46	55	e579	e1110	412	120
4	28	38	24	e29	e20	e23	38	55	e557	e1020	376	108
5	26	37	24	e27	e23	e23	35	54	e691	e990	341	97
6	28	36	24	e28	e23	e21	40	59	e815	e1000	313	100
7	30	37	24	e31	e28	e28	37	78	e899	e1090	282	149
8	29	36	24	e34	e28	e25	39	123	e802	e1120	253	156
9	31	e32	24	e34	e24	e21	45	164	e841	e1280	227	130
10	31	e22	24	e30	e21	e27	48	179	e799	e1070	205	112
11	32	e30	24	e29	e20	e27	43	192	e761	e989	190	100
12	37	e16	23	e33	e19	e28	44	163	e785	e906	175	90
13	37	e22	24	e16	e19	e28	44	152	e801	e1060	170	87
14	33	e19	24	e14	e22	e25	49	161	e818	e940	172	85
15	31	e28	24	e10	e23	e32	44	151	e834	e840	168	117
16	29	e28	22	e21	e26	e34	43	148	e871	e754	185	123
17	29	e27	22	e33	e26	e40	46	182	e965	e760	180	109
18	30	e22	e22	e32	e25	e36	67	e200	e994	e755	165	113
19	35	e22	e25	e31	e23	e36	90	179	e838	e989	153	96
20	33	e21	e32	e31	e25	e33	68	165	e877	e885	150	87
21	32	e24	e38	e26	e20	e37	75	168	e785	e718	151	81
22	34	e22	e38	e29	e21	e42	76	182	e805	e594	162	76
23	39	e16	e32	e26	e23	e33	68	226	e903	536	157	71
24	36	e13	e36	e28	e28	e30	68	265	e927	504	150	66
25	62	e11	e35	e25	e28	25	69	222	e1010	496	143	64
26	46	e20	e39	e24	e25	24	66	218	e1020	490	150	63
27	41	e19	e33	e25	e22	25	61	266	e975	493	155	60
28	39	e21	e32	e26	e23	25	58	e236	e907	481	166	58
29	44	e17	e37	e26	---	24	62	e277	e1020	424	175	56
30	42	e13	e37	e23	---	24	61	e383	e1130	389	160	55
31	41	---	e28	e27	---	27	---	e303	---	381	144	---
TOTAL	1068	763	862	837	653	875	1596	5321	24790	25414	6749	2900
MEAN	34.5	25.4	27.8	27.0	23.3	28.2	53.2	172	826	820	218	96.7
AC-FT	2120	1510	1710	1660	1300	1740	3170	10550	49170	50410	13390	5750
MAX	62	39	39	34	28	42	90	383	1130	1280	469	156
MIN	26	11	22	10	19	21	31	54	329	381	143	55

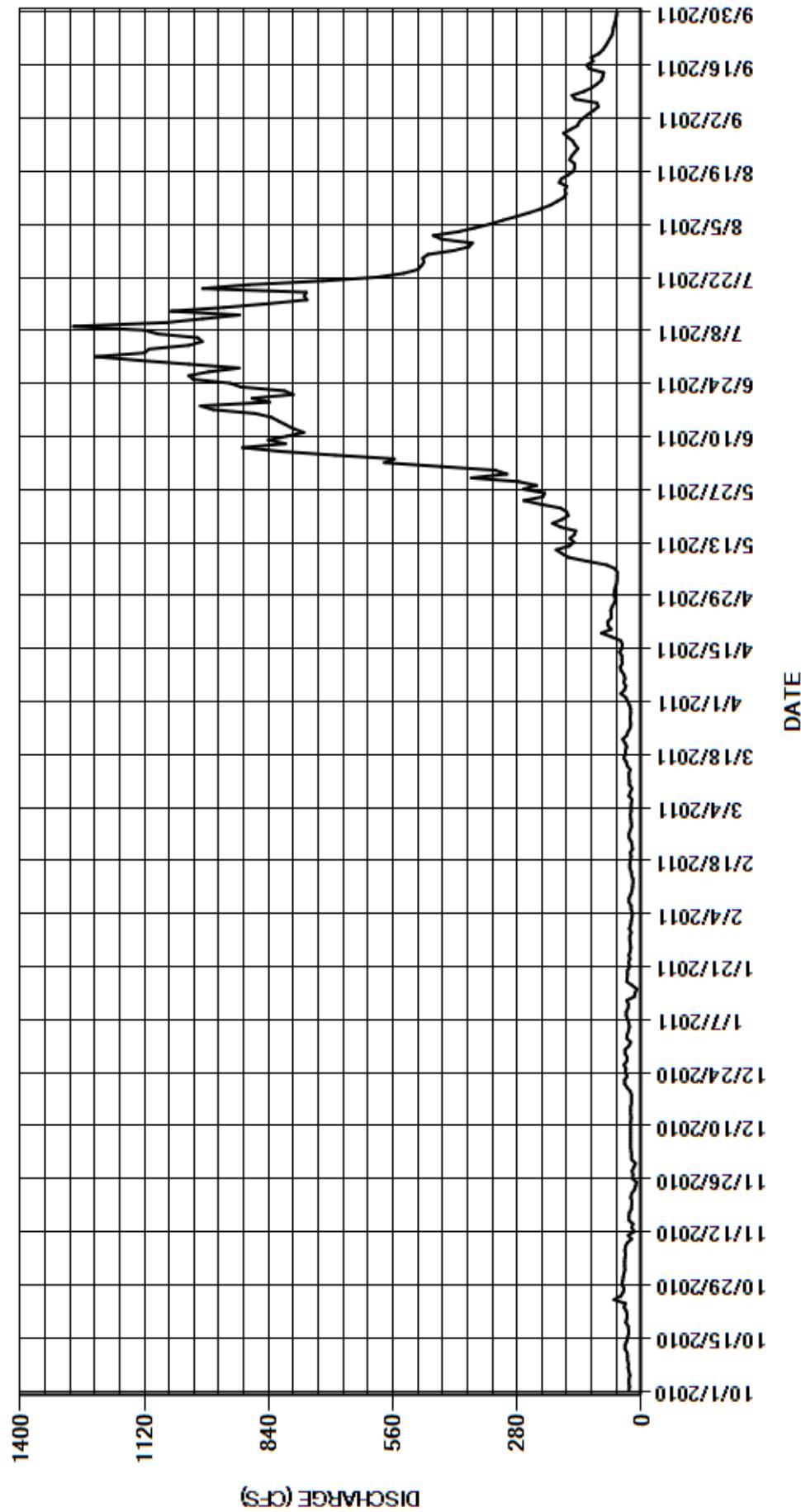
CAL YR	2010	TOTAL	49812	MEAN	136	MAX	1400	MIN	11	AC-FT	98800
WTR YR	2011	TOTAL	71828	MEAN	197	MAX	1280	MIN	10	AC-FT	142500

MAX DISCH: (NOT DETERMINED)

MAX GH: 6.08 FT AT 02:30 ON JUL 09,2011 (BACKWATER DUE TO DEBRIS ON FLASHBOARD SUPPORTS)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06733000 BIG THOMPSON RIVER ABOVE LAKE ESTES
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06734500 FISH CREEK NEAR ESTES PARK
Water Year 2011

Location.--	Lat. N40° 22' 06"; Long. W105° 29' 35" (NAD83). Gage is located on the right side of a 5-foot Parshall Flume 40 ft. off the Fish Creek road approximately 650 ft. upstream from the normal high water mark of Lake Estes 1.3 miles SE of the Town of Estes Park Visitors Center.
Drainage Area and Period of Record.--	16.9 sq mi. (measured from topographic maps). Daily values are available from May 6, 1947 to present.
Equipment.--	Digital incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink2 Data Collection Platform (DCP) transmitting hourly and a graphic water-stage recorder in a 4-ft. by 4-ft. concrete shelter and stilling well at a 5-ft. Parshall Flume. An electric tape gage located on the instrument shelf is the primary reference with a supplemental staff gage located on the left wing wall of the flume at the Ha location. Gage is owned by the United States Bureau of Reclamation (USBR) and operated by the Colorado Division of Water Resources (CDWR). USBR personnel do not visit nor maintain this station on a regular basis.
Hydrologic Conditions.--	Drainage area consisting of mainly grassed and forested lands with some developed areas adjacent to the channel. Flows measured by this gage enter Lake Estes immediately downstream from the gage. There are no diversions away from the channel upstream of gage.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data and chart record as backup. The chart record was largely unreliable this year due to issues with its clock. The gage was not visited regularly in the 2011 Water Year. However, no instrument corrections were necessary nor made this year. The record is complete and reliable except for: November 24 and 25, 2010 when the stage- discharge relation was affected by ice; November 26-28, 2010 when the stilling well was frozen and March 24, 2011, partial day record. Missing values occurring on April 13 and May 18-19, 2011 were filled in with logged DCP data.
	This is a partial year record. The gage was not operated from November 29, 2010 through March 23, 2011.
Datum Corrections.--	Levels were run to the ETG and staff gage on September 9, 2010 using R.M. 0 as base. The ETG was found to be reading 0.016 feet high and the supplemental staff gage was found to be 0.008 low. No corrections were made to either references in lieu of confirming levels.
Rating.--	The control is a 5-foot concrete Parshall flume. Rating FISHESCO06, developed by the United States Geological Survey in 1951 is based on a 5-foot Parshall rating below 3.50 feet of stage and was extended upwards to 7.40 feet on a basis of slope area determination at a stage of 7.32 feet, discharge 1480 cfs . FISHESCO06 was continued this year. No discharge measurements were made this year. However, measurements made in previous years do not indicate the presence of any permanent shift. The peak flow of 21.6 cfs occurred at 1945 on May 23, 2011 at a gage-height of 1.05 ft. using a zero shift. Last year's high measurement (No. 720) made May 19, 2010 exceeded this year's peak by 12.4 cfs and 0.32 ft. of stage respectively.
Discharge.--	The rating was directly applied to the gage-height record to compute discharge. Per agreement with the USBR, DWR and Water Commissioner, discharge measurements within 5% of the rating are adjusted to the rating. Measurements made last year showed unadjusted shifts ranging from -0.01 to +0.03 feet. Although measurement No. 722 exceeded the 5% threshold discussed above, it was considered "poor" due to excessively low measurement depths. It is further assumed that extrapolation techniques used to define the lower portion of the curve are more accurate than the empirical data obtained from this particular measurement.
Special Computations.--	Discharge for the ice affected period, period of frozen stilling well and partial day record was estimated from adjacent good record.
Remarks.--	Due to a lack of visits made to the gage this year as well as confirming discharge measurements the record is rated as fair except for periods of ice effect, frozen stilling well and partial day record which are estimated and poor. Discontinuation of record development for this site is being considered. Station maintained and record developed by R. Stroud.
Recommendations.--	More visits and measurements to this gage should be considered as time and personnel allow. Levels should be run again in the 2012 Water Year. Considerations for concrete degradation remediation should be made.

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06734500 FISH CREEK NEAR ESTES PARK

RATING TABLE-- FISHESCO06 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

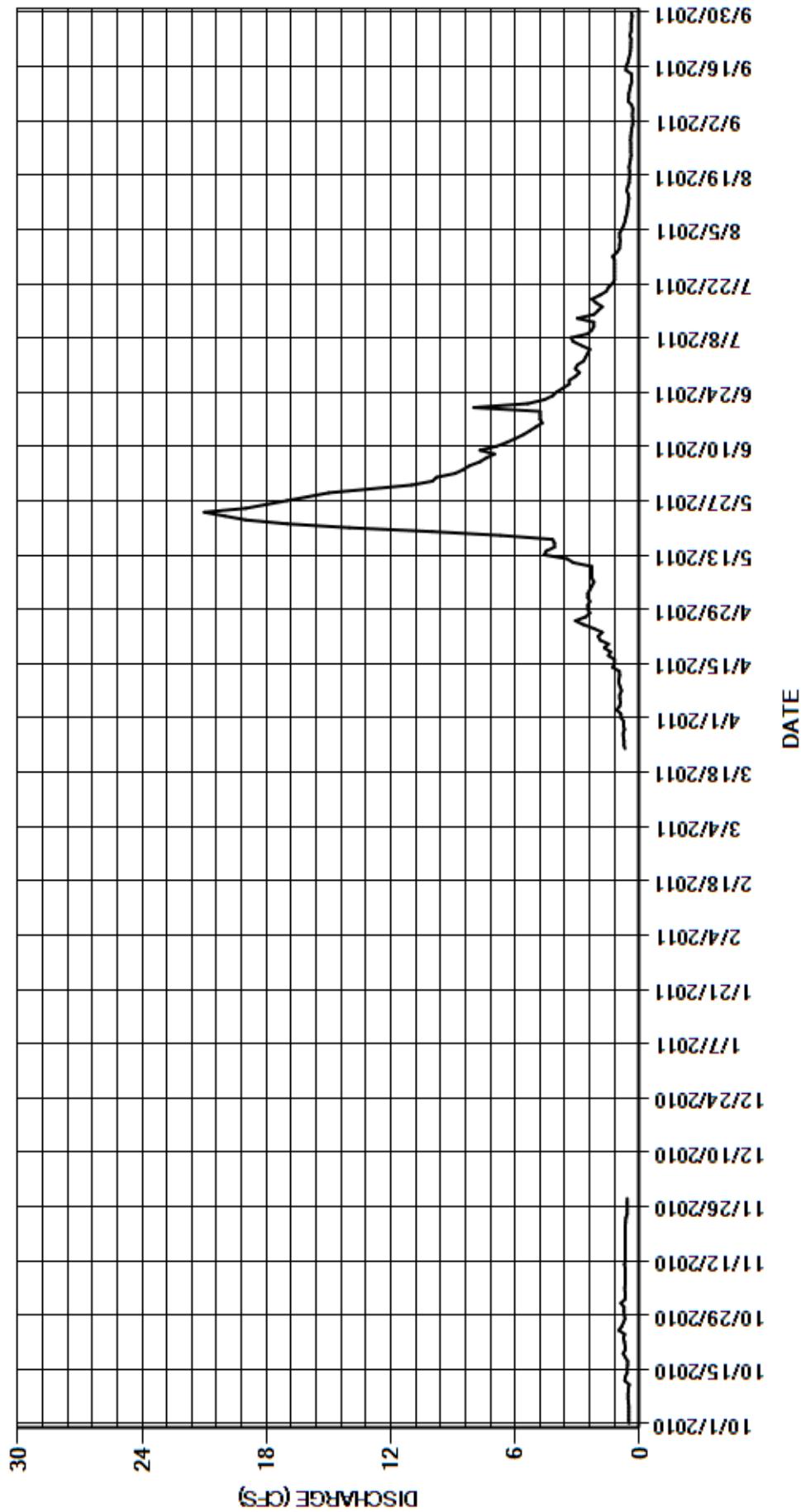
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.51	0.90	---	---	---	---	0.89	2.4	10	3.0	0.96	0.33
2	0.52	0.70	---	---	---	---	0.90	2.5	9.8	2.7	0.93	0.33
3	0.52	0.69	---	---	---	---	1.1	2.5	8.9	2.6	0.96	0.34
4	0.52	0.70	---	---	---	---	0.96	2.4	8.5	2.5	0.96	0.34
5	0.52	0.71	---	---	---	---	0.92	2.3	8.2	2.4	0.85	0.32
6	0.53	0.69	---	---	---	---	0.95	2.2	7.7	2.8	0.77	0.38
7	0.55	0.69	---	---	---	---	0.95	2.3	7.4	3.2	0.70	0.55
8	0.55	0.69	---	---	---	---	0.87	2.3	7.0	3.3	0.67	0.52
9	0.55	0.69	---	---	---	---	0.94	2.3	7.7	2.5	0.61	0.52
10	0.54	0.69	---	---	---	---	1.0	2.3	6.9	2.3	0.59	0.47
11	0.50	0.73	---	---	---	---	0.99	3.2	6.4	2.2	0.56	0.44
12	0.71	0.69	---	---	---	---	0.96	3.5	6.0	2.2	0.54	0.37
13	0.69	0.69	---	---	---	---	0.98	4.6	5.6	3.0	0.52	0.39
14	0.60	0.69	---	---	---	---	1.3	4.5	5.3	2.2	0.55	0.38
15	0.60	0.69	---	---	---	---	1.2	4.1	5.0	2.0	0.62	0.66
16	0.58	0.69	---	---	---	---	1.2	4.1	4.7	1.8	0.57	0.65
17	0.57	0.69	---	---	---	---	1.5	4.2	4.8	2.1	0.50	0.56
18	0.68	0.69	---	---	---	---	1.4	6.7	4.8	2.3	0.49	0.52
19	0.79	0.70	---	---	---	---	1.7	10	4.8	1.9	0.48	0.47
20	0.69	0.69	---	---	---	---	1.5	14	8.0	1.6	0.48	0.44
21	0.70	0.69	---	---	---	---	1.9	17	5.4	1.5	0.51	0.43
22	0.73	0.68	---	---	---	---	2.0	19	4.6	1.3	0.47	0.42
23	0.78	0.66	---	---	---	---	1.8	20	4.2	1.2	0.44	0.41
24	0.72	e0.60	---	---	---	e0.70	2.2	21	4.0	1.2	0.41	0.47
25	1.0	e0.60	---	---	---	0.76	2.7	19	3.7	1.2	0.42	0.41
26	0.86	e0.60	---	---	---	0.75	3.1	18	3.4	1.2	0.42	0.40
27	0.78	e0.60	---	---	---	0.78	2.6	17	3.4	1.2	0.42	0.41
28	0.70	e0.60	---	---	---	0.79	2.4	16	3.1	1.2	0.44	0.38
29	0.74	---	---	---	---	0.73	2.5	15	2.9	1.3	0.42	0.36
30	0.76	---	---	---	---	0.78	2.5	13	3.1	1.1	0.40	0.39
31	0.75	---	---	---	---	0.76	---	11	---	0.97	0.38	---
TOTAL	20.24	19.13	---	---	---	6.05	45.91	268.4	175.3	61.97	18.04	13.06
MEAN	0.65	0.68	---	---	---	0.76	1.53	8.66	5.84	2.00	0.58	0.44
AC-FT	40	38	---	---	---	12	91	532	348	123	36	26
MAX	1.0	0.90	---	---	---	0.79	3.1	21	10	3.3	0.96	0.66
MIN	0.50	0.60	---	---	---	0.70	0.87	2.2	2.9	0.97	0.38	0.32
CAL YR	2010	TOTAL	1165.57	MEAN	5.23	MAX	33	MIN	0.50	AC-FT	2310 (PARTIAL YEAR RECORD)	
WTR YR	2011	TOTAL	628.10	MEAN	2.51	MAX	21	MIN	0.32	AC-FT	1250 (PARTIAL YEAR RECORD)	

MAX DISCH: 21.6 CFS AT 19:45 ON MAY 23,2011 GH 1.05 FT SHIFT 0 FT

MAX GH: 1.05 FT AT 19:45 ON MAY 23,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06734500 FISH CREEK NEAR ESTES PARK
WY2011 HYDROGRAPH



PLATTE RIVER BASIN

06735500 BIG THOMPSON RIVER BELOW LAKE ESTES

Water Year 2011

Location.--	Lat. N40° 22' 34.58"; Long. W105° 29' 7.80" (NAD83). Gage is located on the right side of a 15-ft. Parshall Flume with overflow bays flanking the flume, 620 ft. below Olympus Dam or 1.5 miles east of the Town of Estes Park Visitors Center.
Drainage Area and Period of Record.--	155 sq mi. (USGS Colorado StreamStats utility). Daily values are available from July 1, 1930 to present. From June 24, 1930 to January 28, 1934, non-recording gage located 1.5 miles downstream from present site at a different datum. From January 29, 1934 to March 21, 1951, a recording gage 0.35 miles downstream from present site at a datum 10.50 ft. lower. The present site and datum has been active since March 22, 1951 following completion of Olympus dam in 1949.
Equipment.--	Digital incremental Sutron SDR-0001-4 shaft encoder connected to a Sutron SatLink 2 Data Collection Platform (DCP) transmitting hourly in a 4-ft by 4-ft. concrete shelter and stilling well at a 15-ft. Parshall Flume with overflow bays flanking the flume. The primary reference is an electric tape gage (ETG) in the shelter. There is currently no Ha staff. The well is attached to the flume via one valved inlet; and to the channel upstream of the flume and overflow bays via three valved inlets. When in overflow conditions the flume's inlet can be closed and the channel inlets opened. A supplementary (Non-Ha) staff gage, located above the flume, can be used during these periods. Stage readings will be higher than in the flume and would require a separate rating. The channel inlets have not been operated for record purposes since the early 1950's, before the installation of the overflow flash boards. Gage is owned by the United States Bureau of Reclamation (USBR) and maintained and operated cooperatively with the Colorado Division of Water Resources (DWR). On July 13, 2011 the Sutron 8210 DCP with HDR GOES transmitter was upgraded to the Sutron SatLink2 DCP and the Design Analysis H-334 and Sutron SDR-0001-1 shaft encoders were replaced by the Sutron SDR-0001-4 at the same time.
Hydrologic Conditions.--	Controlled release from Olympus Dam.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data and 5-minute logged SDR data as backup. Frequent visits by USBR and DWR personnel show good agreement between sensor and base gage. Six instrument corrections ranging from -0.01 ft. to +0.01 ft. were made throughout the year. The corrections were applied to the record as defined by DWR and USBR visits. The record is complete and reliable. Two erroneous 15-minute values recorded at 1130 and 1145 on November 2, 2010 during flume cleaning activities were interpolated from adjacent good record without loss of accuracy. Missing values on July 13, 2011 from 0930 to 1115 during satellite monitoring equipment upgrade were interpolated from adjacent good record without loss of accuracy. Due to the flume's proximity to the dam, ice accumulation in the approach, flume, and departing sections is generally not an issue. Algal growth in the flume can affect the flumes performance. The flume was cleaned on November 2, 2010 and February 24, 2011. Neither cleaning returned notable cleaning corrections this year. Site observations and discharge measurements made on September 2 and October 5, 2011 indicated affect from algal growth in the flume. Necessary high releases made from Olympus Dam caused the overflow bays to become sporadically active from June 6-8 and July 6, 2011.
Datum Corrections.--	Levels were last run on February 27, 2008 using R.M.3 as base. The Base reference was found to be 0.01 low. The correction was made at the time levels were run.
Rating.--	The control is a 15-foot Parshall Flume with overflow bays flanking the flume. Rating BTBLESSCO10, in use since October 1, 1997, was continued in use for all of Water Year 2011. The rating is a standard 15-foot Parshall Flume rating from 0.00 to 5.00 ft. of stage and custom above this point to account for water flowing over the overflow bays. A site visit on July 6, 2011 identified 5.32 ft. (as indicated on the Ha inlet operation) as being the exact stage at which the overflow bays become active. Because of the rarity of the overflow bays being active this portion of the rating is poorly defined. The rating has been confirmed by measurements from 6.8 to 1000 cfs. Ten discharge measurements (Nos. 214-223) were made during the year ranging in discharge from 19.3 to 948 cfs, covering the range in stage experienced this year well. The peak flow of 989 cfs occurred at 1500 on June 6, 2011 at a gage-height of 5.61 ft. with a shift of +0.13 ft. It exceeded high flow Measurement No. 219 made June 7, 2011 by 41 cfs and 0.13 ft. of stage.
Discharge.--	Shifting control method was used all year. Shifts are principally caused by vegetal growth in the flume and by ambiguity in the rating when in the overflow condition. Shifts were applied by time as defined by measurements. Variable shift table BTBLESCOVST11-1 defined by 5 measurements (Nos. 218-222) was applied to the record from May 16, 2011 through August 9, 2011 to account for the shift seen when in the overflow condition. Open water measurements showed raw shifts varying between -0.02 and +0.13 ft. All were given full weight except for Nos. 214-218 and 220 which were discounted up to ± 2.78% to smooth shift distributions.
Special Computations.--	None.
Remarks.--	The record is good. The rating well defines the range in flow experienced this year except for the upper extremes when the flume's overflow bays became active (June 6-8 and July 6, 2011). Station maintained and record developed by Russell V. Stroud.

Recommendations.--

Fabrication of the necessary brackets and fasteners to properly and securely mount the Ha staff should be undertaken. Semi permanent installation of a clothesline style cableway for Acoustic Doppler Current Profiler (ADCP) use should be considered. Continued moderate to high flow measurement opportunities should be watched for and performed with the ADCP unit. Exercising the inlet valves should be done following the winter period.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06735500 BIG THOMPSON RIVER BELOW LAKE ESTES

RATING TABLE-- BTBLESSCO10 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

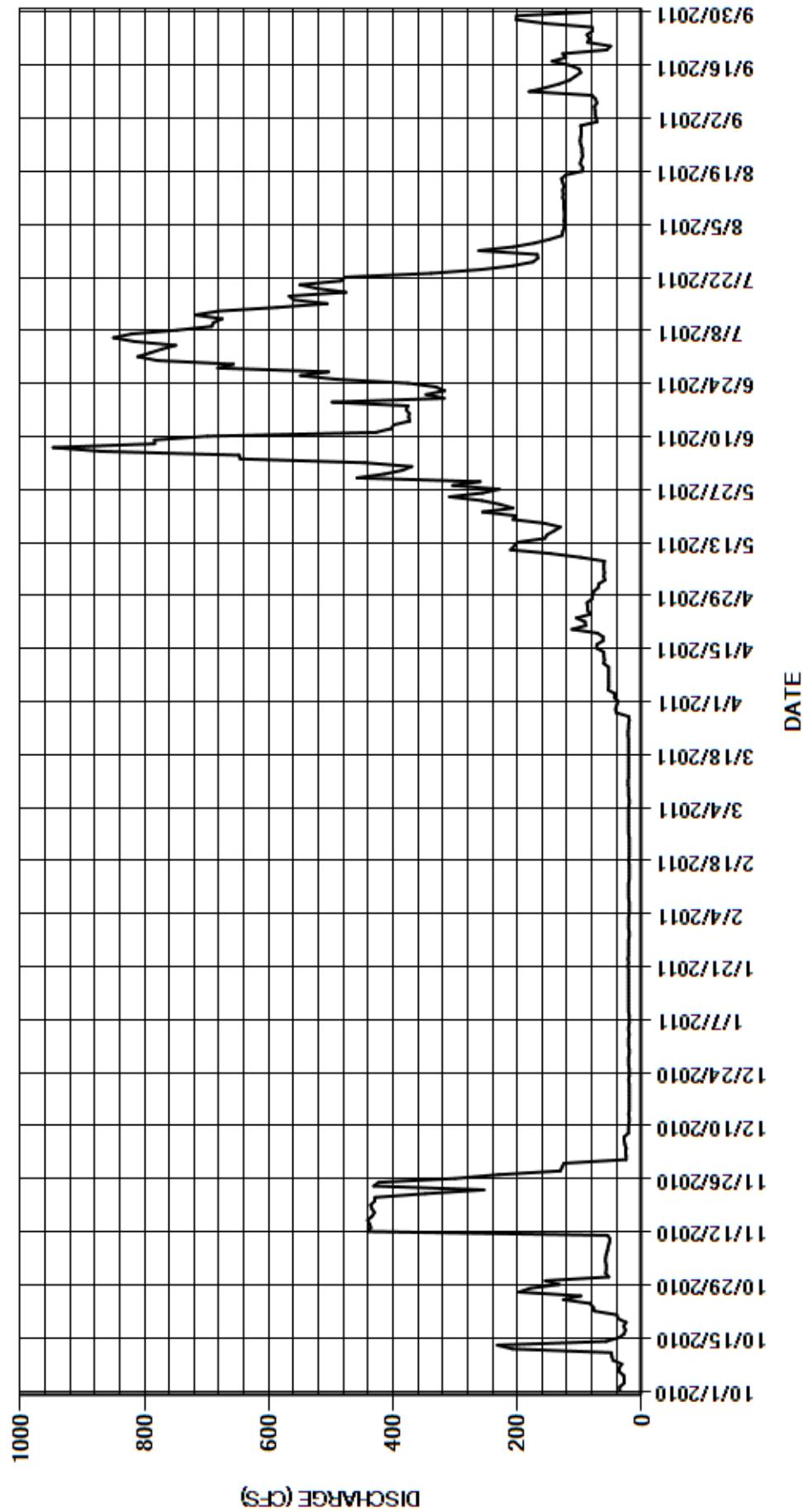
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	35	58	25	21	21	21	38	70	385	811	148	72
2	35	57	25	21	21	21	44	69	370	791	128	73
3	28	57	26	20	21	21	43	59	446	772	127	75
4	28	58	25	21	20	21	54	61	646	750	125	75
5	29	58	27	21	20	20	53	60	648	816	124	76
6	36	57	28	20	20	20	53	61	869	850	125	72
7	36	55	28	20	20	21	53	61	947	821	124	74
8	32	54	21	20	21	21	53	60	784	748	124	80
9	46	52	21	21	21	21	53	98	784	692	125	181
10	48	51	21	21	21	22	53	146	699	689	125	155
11	49	55	20	21	21	22	61	211	428	675	125	133
12	208	441	20	21	21	21	60	205	403	719	127	116
13	232	436	21	21	20	21	61	200	399	682	126	107
14	57	438	20	21	20	21	61	156	373	587	127	98
15	36	441	20	21	20	21	72	152	375	506	125	101
16	28	434	20	21	20	21	72	141	374	560	127	117
17	26	430	20	21	20	21	62	131	379	567	129	144
18	29	434	20	21	21	21	62	156	376	476	122	122
19	25	436	20	21	20	21	71	207	498	522	95	127
20	38	430	20	21	20	21	112	203	318	550	95	56
21	40	429	20	22	20	21	90	256	347	484	99	50
22	76	348	21	21	20	21	91	207	317	477	97	87
23	78	254	20	22	20	22	105	228	331	339	95	84
24	83	431	20	21	20	22	82	257	376	258	96	88
25	126	423	20	21	21	21	87	309	490	207	96	79
26	98	300	21	21	21	21	87	256	549	175	98	80
27	197	230	21	21	21	20	88	229	504	167	99	155
28	180	131	21	21	21	21	80	304	682	168	98	202
29	133	128	20	20	---	41	79	260	657	262	97	201
30	155	125	20	20	---	42	77	458	780	206	97	81
31	53	---	21	21	---	40	---	414	---	172	98	---
TOTAL	2300	7331	673	647	573	712	2057	5685	15534	16499	3543	3161
MEAN	74.2	244	21.7	20.9	20.5	23.0	68.6	183	518	532	114	105
AC-FT	4560	14540	1330	1280	1140	1410	4080	11280	30810	32730	7030	6270
MAX	232	441	28	22	21	42	112	458	947	850	148	202
MIN	25	51	20	20	20	20	38	59	317	167	95	50
CAL YR	2010	TOTAL	37595	MEAN	103	MAX	978	MIN	15	AC-FT	74570	
WTR YR	2011	TOTAL	58715	MEAN	161	MAX	947	MIN	20	AC-FT	116500	

MAX DISCH: 989 CFS AT 15:00 ON JUN 06,2011 GH 5.61 FT SHIFT 0.13 FT

MAX GH: 5.61 FT AT 15:00 ON JUN 06,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06735500 BIG THOMPSON RIVER BELOW LAKE ESTES
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06734900 OLYMPUS TUNNEL (ESTES FOOTHILLS CANAL)
Water Year 2011

Location.--	Lat. N40° 22' 25.82", Long. W105° 28' 25.64" (NAD83). Gage is located on the right side of a tunnel at a covered rectangular concrete section 0.75 mi east of Olympus Dam or 2.20 mi east of the Town of Estes Park Visitors Center.
Drainage Area and Period of Record.--	Controlled release from Olympus Dam. Olympus Tunnel, a component of the Colorado-Big Thompson system conveys water from Olympus Dam (Lake Estes) to Pinewood Reservoir for subsequent diversion to other C-BT facilities. Daily values are available from the DWR from: April 1, 1953 to September 30, 1969; and October 1, 1979 to present.
Equipment.--	Digital incremental Sutron SDR-0001-4 shaft encoder connected to a Sutron SatLink2 Data Collection Platform (DCP) transmitting hourly in a 4-ft. by 4-ft. concrete shelter and stilling well at a rectangular concrete canal section. A SonTek Argonaut SW Acoustic Doppler Velocity Meter (ADVM) is placed in the center of the canal approximately 20-feet upstream from the shelter. An electric tap gage on the instrument bench servers as the primary reference with a supplemental staff gage located on the left wall at the canal's hatch opening. Gage is operated in cooperation of the Colorado Division of Water Resources (DWR) and the United States Bureau of Reclamation (USBR) as part of the Colorado-Big Thompson (C-BT) Project. Facilities are owned, operated and maintained by the USBR.
	The Design Analysis H-335 incremental shaft encoder, Sutron SDR-0001-1 and Sutron 8210 DCP were removed on July 13, 2011 and were replaced by the instrumentation configuration described above.
Hydrologic Conditions.--	Controlled release from Olympus Dam. Olympus Tunnel, a component of the Colorado-Big Thompson system conveys water from Olympus Dam (Lake Estes) to Pinewood and Flatiron Reservoirs and is used to generate power at the Pole Hill and Flatiron hydroelectric power plants. Waters entering Flatiron reservoir from Olympus Tunnel can then be: conveyed to terminal storage at Horsetooth Reservoir via the Charles Hansen Feeder Canal; used for power generation at the Big Thompson Power Plant located along the Charles Hansen Feeder Canal system and then delivered to the Big Thompson River; directly delivered to the Big Thompson River via the Charles Hansen Feeder Canal Wasteway (HFCWASCO) facility; pumped to Carter Reservoir for either terminal storage in Carter Reservoir and/or distribution through the Saint Vrain Supply Canal where direct delivery to the Saint Vrain Creek can be made; terminal storage in Boulder Reservoir via the Boulder Feeder Canal (BFCLYOCO) system.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP and SDR data as backup. The record is complete and reliable, except for a couple of hours on July 13, 2011 when the DCP was upgraded. Data validation between the two instruments was generally good (within +/- 0.02 ft). All other significant (> +/- 0.02 ft) variances were determined to be caused by a significant stage change occurring as a result of the USBR's operations. USBR operations cause many significant stage changes to be made at midnight which at times causes the logged midnight value (often the daily maximum or daily minimum) to be logged on a different day. This is postulated to be due to interval timing, clock calibration differences and/or difference in measurement processing times between the two instruments. Frequent visits by USBR and DWR staff demonstrated good calibration and agreement between both instruments and the base gage throughout the water year. Two instrumentation corrections were applied to the primary record as indicated by the visit log: March 24, 2011: -0.01 feet and August 9, 2011: -0.01 feet.
Datum Corrections.--	Levels were last run on November 2, 2006 to verify the installation of a new electric tape gage installed on March 23, 2006. No correction was needed.
Rating.--	The control is a rectangular concrete canal section. Rating No. 7 in use since October 2005 was continued again this year. Rating No. 7 was created using Rating No. 6 (defined by measurements) up to about 4.30 feet of stage and 272 cfs. Above this point Rating No. 7 is not based on measurements, but instead is based on USBR estimates of flow released into Olympus Tunnel. These estimates assume that the Adams Tunnel gage is working properly (see ADATUNCO for more details). Rating No. 7 is a temporary solution until more resolution of noted discrepancies can be fully documented. Olympus Tunnel does not present a typical velocity distribution, and as such conventional measurement techniques will mismeasure this structure. On March 27, 2008 an ADVM was installed in the center section of Olympus Tunnel approximately 20-feet upstream from the gage shelter. The ADVM was placed in cooperation of DWR and USBR to help resolve issues associated with Rating No. 7. A velocity index rating is in the process of being developed consisting of vertically integrated (five point) current meter measurements throughout the full operational range. Current meter measurements of this type require a tremendous amount of time to perform and opportunities to perform these measurements at targeted stages are limited due to current operational practices of the tunnel. Thus, a velocity index rating may take some time to fully define and refine. Records computed using Rating No. 7 should be considered fair henceforth until such time that a comparison can be made between conventionally computed discharge values and ADVM computations. No discharge measurements were made this year. The peak flow of 572 cfs occurred at 2115 December 27, 2010 at a gage height of 8.20 feet with a shift of 0.00 ft. It exceeded measurement No. 467 made on November 13, 2007 by 1.80 feet of stage and 111 cfs.
Discharge.--	Until completion of the velocity indexed rating process the rating is applied directly to the gage-height record to compute discharge.

Special Computations.-- Zero flow is determined operationally. Residual gage-heights of 0.16 ft and below have been recorded and observed when the tunnel has been dewatered. Zero flow was determined to have occurred on part of the day or the whole day from October 4 through December 17, 2010. A time adjustment was made to the SDR from local to GMT on December 29, 2010, thereby, requiring manual adjustment of logged time and stage values before and after the adjustment.

Remarks.-- The record is fair. Station maintained by Russell V. Stroud. Record developed by Lee Cunning and Russell V. Stroud.

Recommendations.-- Five point current meter measurements need to be made at targeted stages for development of a velocity indexed rating. Every effort should be made to perform these measurements and develop the rating in an expeditious manner, requiring close coordination with USBR Water Scheduling staff.

STATE OF COLORADO
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06734900 OLYMPUS TUNNEL (ESTES FOOTHILLS CANAL)

RATING TABLE-- OLYTUNCO07 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

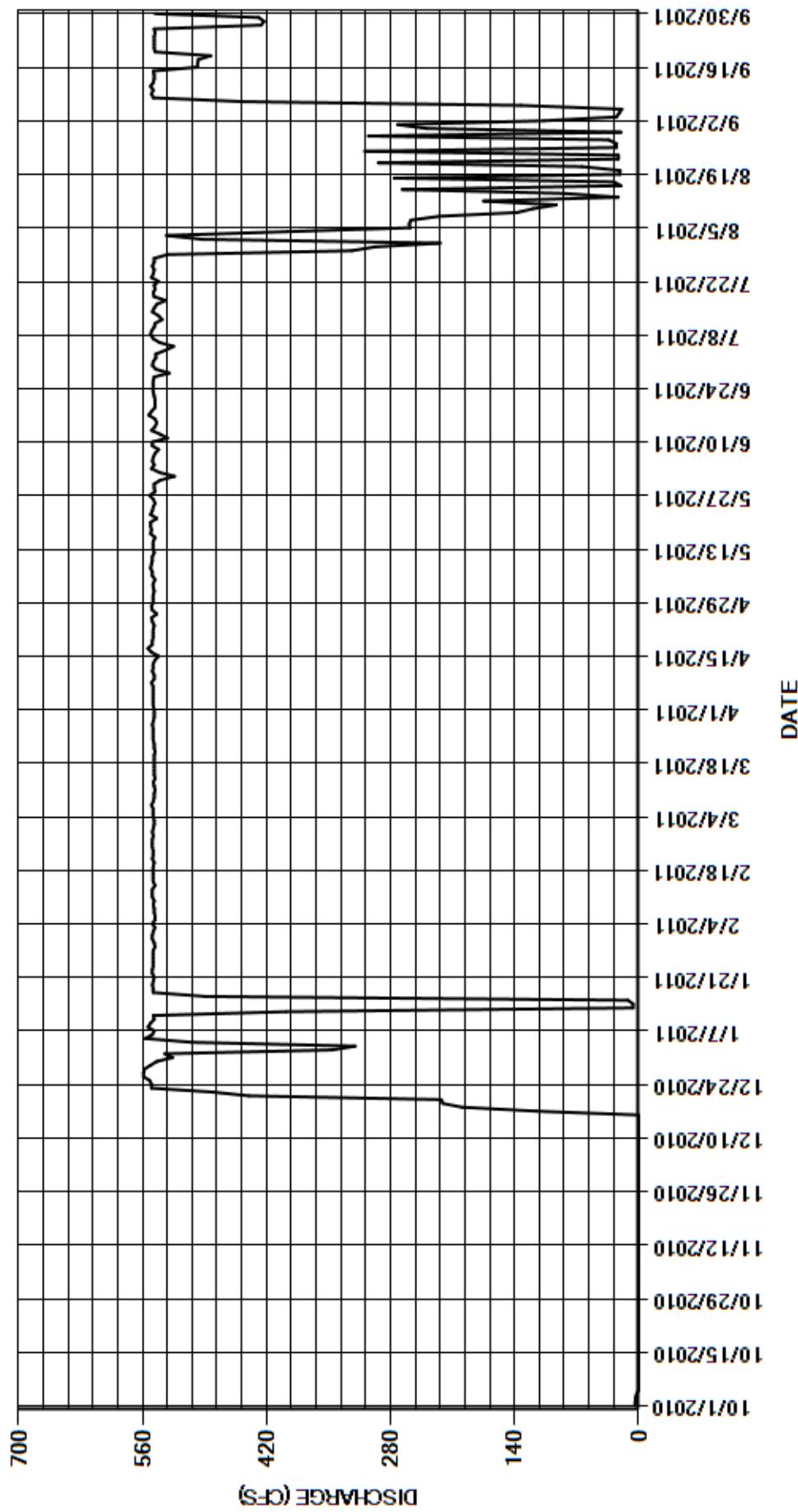
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.0	0.00	0.00	535	549	548	547	548	524	548	224	272
2	3.8	0.00	0.00	346	548	547	548	547	541	545	493	107
3	3.7	0.00	0.00	320	546	547	548	548	550	545	533	25
4	2.2	0.00	0.00	504	549	548	548	548	547	534	397	22
5	0.00	0.00	0.00	557	546	548	548	546	549	525	258	19
6	0.00	0.00	0.00	549	546	548	548	549	548	541	259	133
7	0.00	0.00	0.00	547	547	550	548	549	546	548	257	447
8	0.00	0.00	0.00	554	547	548	550	551	542	551	225	548
9	0.00	0.00	0.00	551	548	547	547	550	549	550	137	550
10	0.00	0.00	0.00	547	547	547	547	549	549	547	119	548
11	0.00	0.00	0.00	548	549	546	549	549	532	546	93	551
12	0.00	0.00	0.00	398	549	547	548	547	540	538	175	548
13	0.00	0.00	0.00	6.3	549	548	548	548	550	542	23	547
14	0.00	0.00	0.00	6.2	546	546	546	548	546	549	84	547
15	0.00	0.00	0.00	12	548	547	542	548	544	547	267	548
16	0.00	0.00	0.00	490	548	547	550	546	546	544	20	498
17	0.00	0.00	116	548	548	547	554	551	553	534	28	498
18	0.00	0.00	199	548	548	547	549	550	550	547	276	497
19	0.00	0.00	221	549	548	547	549	551	546	548	21	483
20	0.00	0.00	223	548	547	547	548	551	546	546	21	546
21	0.00	0.00	440	547	549	546	548	544	546	547	64	547
22	0.00	0.00	482	549	548	547	548	551	547	542	294	547
23	0.00	0.00	550	549	548	547	547	549	548	550	23	547
24	0.00	0.00	550	548	549	548	549	548	548	548	23	547
25	0.00	0.00	552	548	549	548	550	546	548	547	309	546
26	0.00	0.00	559	548	549	548	544	548	548	549	25	547
27	0.00	0.00	559	548	548	548	549	552	547	547	25	426
28	0.00	0.00	558	548	549	549	550	546	530	547	34	423
29	0.00	0.00	551	546	---	548	548	547	545	532	305	429
30	0.00	0.00	544	547	---	547	548	547	549	324	20	546
31	0.00	---	526	549	---	547	---	540	---	298	240	---
TOTAL	13.70	0.00	6630.00	14690.5	15342	16970	16443	16992	16354	16406	5272	13039
MEAN	0.44	0.000	214	474	548	547	548	548	545	529	170	435
AC-FT	27	0	13150	29140	30430	33660	32610	33700	32440	32540	10460	25860
MAX	4.0	0.00	559	557	549	550	554	552	553	551	533	551
MIN	0.00	0.00	0.00	6.2	546	546	542	540	524	298	20	19
CAL YR	2010	TOTAL	115742.70	MEAN	317	MAX	559	MIN	0.00	AC-FT	229600	
WTR YR	2011	TOTAL	138152.20	MEAN	378	MAX	559	MIN	0.00	AC-FT	274000	

MAX DISCH: 572 CFS AT 21:15 ON DEC 27,2010 GH 8.20 FT SHIFT 0 FT

MAX GH: 8.20 FT AT 21:15 ON DEC 27,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06734900 OLYMPUS TUNNEL (ESTESFOOTHILLSCANAL)
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06736000 NORTH FORK BIG THOMPSON RIVER AT DRAKE
Water Year 2011

Location.--	Lat. N40°25'59.77"; Long. W105°20' 23.04" (NAD83) Larimer County, CO. Gage is located on the right bank of channel approximately 400 ft. upstream from the confluence with the Big Thompson River in Drake, CO.
Drainage Area and Period of Record.--	85.1 mi ² (USGS Colorado StreamStats utility). Daily values are available from May 14, 1947 to September 30, 1955 and October 1, 1978 to present.
Equipment.--	Digital incremental Sutron 8500 shaft encoder connected to a Sutron SatLink1 Data Collection Platform (DCP) transmitting hourly, and a graphical chart recorder in a 42-inch Corrugated Metal Pipe (CMP) shelter and stilling well. The stilling well is connected to the stream via two 2-inch inlets equipped with gate valves, street keys and a flushing tank (exterior). An Electric Tape Gage (ETG) located on the instrument shelf is the primary reference with a supplemental cantilever chain gage located 10-feet upstream of the shelter.
Hydrologic Conditions.--	Drainage area consisting of mainly forested lands and canyons of varying topography. The town of Glen Haven, other residential properties and a state highway are built along the side of much of the north fork channel.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data and chart record as backup. Instrument calibration was supported by twenty-four visits to the gage. One instrument correction of -0.01 ft. was made on June 2, 2011. It was applied to the record as defined by visits made to the gage. The record is complete and reliable, except as follows: November 9-16 and 22-28, 2011, stage-discharge relation affected by ice; November 17-21 and 29-December 8, 2010, gage-height data are unreliable due to frozen inlets and stilling well; December 9, 2010 through March 24, 2011, when the gage was off for winter and record is unavailable; May 23-25, June 2, 7, 17-28, July 1-2, 11, 15 and 29, when the gage's inlets were either sluggish or plugged and stage data were unreliable from four or more hours. Eight missing stage values occurring on July 30, 2011 were filled in with chart record without loss of accuracy. One stage value per day on May 23, July 2, and 15, 2011 were adjusted to accommodate proper distribution of flush corrections discussed below. Large consecutive flush corrections were required during the bulk of this year's runoff. Flush corrections ranged in magnitude from -0.08 to +0.26 ft. Debris accumulation (leaf detritus) on the control is an issue during the fall period. Two debris removal corrections were made this year on November 2, 2010 and May 16, 2011. Debris removal corrections were applied to the record as shifts.
Datum Corrections.--	Levels were last run October 15, 2009 and September 9, 2010 to verify RM establishment. No correction was required to the primary reference nor RM elevation assignments either time.
Rating.--	The control for low to moderate stages is a low head concrete dam located approximately 8-feet downstream of the shelter. The channel reverts to channel control at higher stages. As there is little freeboard in this channel, the controlling feature for flood level stages has not been determined. Rating BTNFDRCO11, in use since October 1, 2002 was continued in use for all of WY2011. It is defined by measurements from the Point of Zero Flow (PZF) occurring at 3.40 ft. to 232 cfs. Fifteen discharge measurements (Nos. 346-360) were made during the year, ranging in discharge from 3.75 to 144 cfs covering the range in stage experienced this year well except for the higher daily flows from June 9 through July 9 and 12-14, 2011. The peak flow of 229 cfs occurred at 0445 on July 13, 2011 at a gage-height of 4.67 ft. with a shift of +0.05 ft. It exceeded high flow Measurement No. 356 by 85 cfs and 0.20 ft. of stage.
Discharge.--	Shifting control method was used for all periods of good record. Shifts are caused by accumulation of debris on the control, fill and scour of material in the gage pool and noted accelerated deterioration of the control. Shifts were distributed by time as defined by measurements from October 1 to November 8, 2010, March 24 through May 16 and September 1 through October 4, 2011. Variable shift table BTNFRCOVST11-1, defined by nine measurements (Nos. 352-360) made during and adjacent to the period of use, was applied from May 16 through September 1, 2011. Open water measurements showed shifts varying between 0.01 and 0.05 ft., all in the positive direction. All were given full weight except for Nos. 355 and 359 which were discounted -2.61% and 4.31% respectively to smooth shift distributions.
Special Computations.--	Discharge for ice affected periods and winter periods was estimated from adjacent good record, temperature trends and 5 discharge measurements made during the winter period. Discharge for the period of sluggish or plugged inlets (June 17-28, 2011) was estimated from adjacent good record, graphs of estimated gage-heights and trends from the Big Thompson Above Lake Estes (BTABESCO) gage. Estimated discharges for the period of sluggish or plugged inlets were compared against computed discharge values to determine record quality ratings.
Remarks.--	The record is good, except for periods of ice affect and no gage height record, which is estimated and poor; May 23 -June 16 and June 29-July 29, 2011 (including the peak), which is fair due to numerous, persistent problems with intake operation; and June 17-28, 2011, which is estimated and poor due to plugged or extremely sluggish intakes. Station operated and record developed by R. Stroud.
Recommendations.--	Degradation of the control noted in previous years continues. Levels run on October 15, 2009 indicated the PZF elevation was 3.40 feet; whereas levels run on September 9, 2010 indicate that the PZF is now at 3.15 feet at a location where the control had failed. Although well defined, the control should be replaced. Plans have been developed to replace the control and shelter such that when funds come available immediate action can take place. A new inlet will be placed early in WY2012 to help resolve sluggish inlet issues seen in previous years. If inlet plugging continues, a Sutron Constant Flow Bubble (CFB) will be placed as an emergency solution. Installation of a bank operated cableway should be evaluated to help define the upper portion of the rating.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06736000 NORTH FORK BIG THOMPSON RIVER AT DRAKE

RATING TABLE-- BTNFDRCO11 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

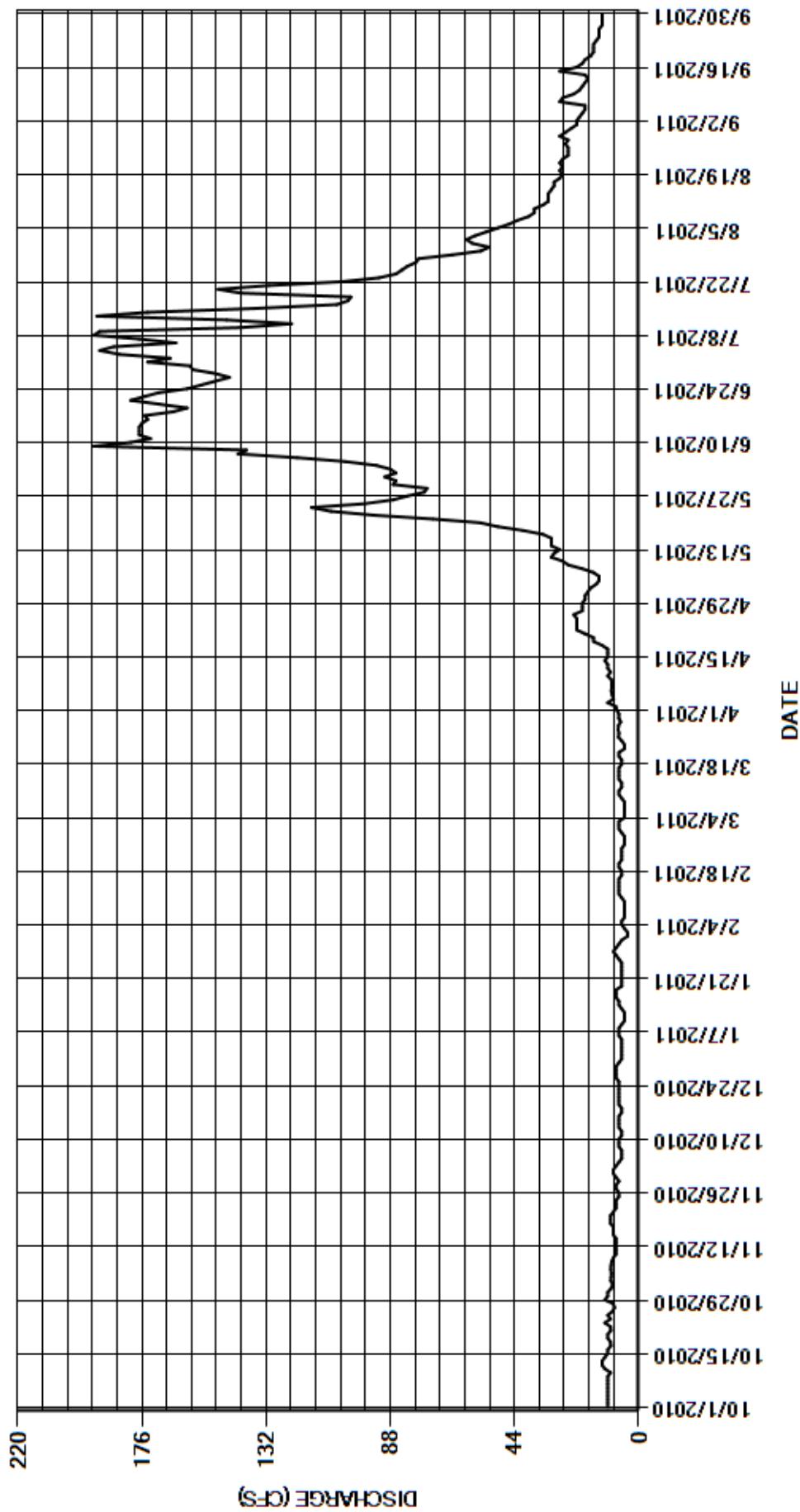
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	11	9.8	e9.0	e6.0	e4.0	e7.0	7.7	19	90	174	59	22
2	11	9.2	e9.0	e6.0	e4.0	e7.0	8.1	18	86	166	61	22
3	11	9.9	e8.0	e6.0	e5.0	e7.0	11	17	88	184	58	21
4	11	9.8	e7.0	e6.0	e6.0	e5.0	8.9	15	93	191	54	20
5	11	9.7	e6.0	e6.0	e6.0	e5.0	9.4	14	104	186	50	19
6	11	9.9	e6.0	e7.0	e5.0	e5.0	9.7	14	121	164	46	19
7	11	9.8	e6.0	e7.0	e5.0	e5.0	9.6	16	142	177	43	28
8	11	9.6	e7.0	e7.0	e5.0	e5.0	9.5	20	139	193	39	27
9	11	e9.0	e7.0	e6.0	e5.0	e6.0	9.7	25	193	191	37	23
10	10	e8.0	e7.0	e5.0	e5.0	e7.0	11	27	180	141	37	21
11	12	e8.0	e6.0	e5.0	e6.0	e7.0	10	31	173	123	34	20
12	13	e8.0	e6.0	e5.0	e7.0	e6.0	11	30	177	146	32	19
13	13	e8.0	e7.0	e6.0	e7.0	e6.0	11	28	177	192	32	18
14	12	e8.0	e7.0	e7.0	e7.0	e7.0	12	31	177	174	32	19
15	11	e9.0	e7.0	e7.0	e7.0	e7.0	11	31	176	136	31	28
16	11	e9.0	e7.0	e8.0	e7.0	e7.0	11	31	174	107	30	22
17	9.9	e9.0	e6.0	e8.0	e6.0	e7.0	11	34	e175	103	30	20
18	10	e10	e6.0	e8.0	e6.0	e6.0	13	41	e165	102	28	19
19	11	e10	e7.0	e6.0	e7.0	e6.0	16	50	e160	141	27	17
20	11	e10	e7.0	e6.0	e7.0	e7.0	16	56	e170	149	28	16
21	9.9	e9.0	e7.0	e6.0	e6.0	e7.0	19	73	e180	131	27	16
22	10	e8.0	e7.0	e6.0	e6.0	e5.0	22	94	e175	105	28	16
23	12	e8.0	e7.0	e6.0	e6.0	e5.0	22	109	e170	92	27	15
24	10	e8.0	e7.0	e6.0	e6.0	e6.0	22	116	e160	86	25	14
25	11	e7.0	e7.0	e6.0	e5.0	7.2	22	97	e155	84	25	14
26	9.3	e7.0	e8.0	e7.0	e5.0	7.0	23	87	e150	82	25	14
27	8.6	e8.0	e8.0	e8.0	e5.0	7.3	20	82	e145	79	26	13
28	9.0	e8.0	e8.0	e9.0	e6.0	7.2	20	76	e150	78	25	13
29	12	e7.0	e8.0	e8.0	---	6.4	20	75	158	66	28	13
30	11	e8.0	e7.0	e7.0	---	7.1	19	87	159	56	26	13
31	11	---	e6.0	e6.0	---	7.0	---	86	---	53	24	---
TOTAL	336.7	261.7	218.0	203.0	162.0	197.2	425.6	1530	4562	4052	1074	561
MEAN	10.9	8.72	7.03	6.55	5.79	6.36	14.2	49.4	152	131	34.6	18.7
AC-FT	668	519	432	403	321	391	844	3030	9050	8040	2130	1110
MAX	13	10	9.0	9.0	7.0	7.3	23	116	193	193	61	28
MIN	8.6	7.0	6.0	5.0	4.0	5.0	7.7	14	86	53	24	13
CAL YR	2010	TOTAL	14178.4	MEAN	38.8	MAX	362	MIN	4.0	AC-FT	28120	
WTR YR	2011	TOTAL	13583.2	MEAN	37.2	MAX	193	MIN	4.0	AC-FT	26940	

MAX DISCH: 229 CFS AT 04:45 ON JUL 13,2011 GH 4.67 FT SHIFT 0.05 FT

MAX GH: 4.67 FT AT 04:45 ON JUL 13,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06736000 NORTH FORK BIG THOMPSON RIVER AT DRAKE
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
DILLE TUNNEL NEAR DRAKE
Water Year 2011

Location.--	Lat. N40° 25' 6.16", Long. W105° 14' 36.10" (NAD83, Spotted from topographic map). Gage is located at the West portal of Dille Tunnel. Dille Tunnel diverts water from the Big Thompson River conveying it to the Charles Hansen Feeder Canal. Water delivered to the feeder canal can then be subsequently conveyed to terminal storage at Horsetooth Reservoir or used for power generation at the Big Thompson Power Plant (BTPPMCO) with subsequent delivery back to the Big Thompson River or directly returned to the river via the Charles Hansen Feeder Canal Wasteway (HFCWASCO) structure. An 8-ft. concrete Parshall Flume is located inside the tunnel.
Drainage Area and Period of Record.--	304 sqmi (USGS Colorado StreamStats utility). Basin is heavily regulated by the Colorado – Big Thompson (C-BT) project upstream of this diversion. Daily values are available from 1950 to present.
Equipment.--	Digital incremental Sutron SDR-0001-1 shaft encoder connected to a Sutron SatLink2 Data Collection Platform (DCP) transmitting hourly in a rectangular concrete shelter over top a concrete stilling well near an 8-ft. Parshall Flume. The gage is equipped with an electric tape gage located on the instrument shelf serving as the primary and only active reference. A staff gage is located at the flume's Ha location but cannot be observed when the flume is operational as the flume is located approximately 80-feet downstream in the tunnel. The gage is owned by the United States Bureau of Reclamation (USBR) and is operated cooperatively by the USBR, Northern Colorado Water Conservancy District (NCWCD) and the Colorado Division of Water Resources (CDWR) as a component of the C-BT project.
	The DCP was upgraded from a Sutron SatLink1 to its current configuration on September 8, 2011. The Sutron 56-0540-400 -DTR shaft encoder was removed and the SDR-0001-1 was promoted to the primary sensor concurrently.
Hydrologic Conditions.--	Controlled diversion. Flow is regulated by a check structure and radial gate diverting water from the Big Thompson River; conveying it to the Charles Hansen Feeder Canal several miles downstream. Waters delivered to the feeder canal can then be subsequently conveyed to terminal storage at Horsetooth Reservoir or used for power generation at the Big Thompson Power Plant (BTPPMCCO) with subsequent delivery back to the Big Thompson River or directly returned to the river via the Charles Hansen Feeder Canal Wasteway (HFCWASCO) structure. A large stilling basin and energy dissipation devices are located downstream from the radial gate and upstream from the flume's converging section. Direct observation of the flume's performance is not possible.
Gage-Height Record.--	The primary record is 15-minute telemetered data with 15-minute logged DCP and SDR data as backup. Frequent visits by NCWCD and DWR personnel show good agreement between the sensors and base gage. The record is complete and reliable. Missing satellite values on May 1 and 25, 2011 were filled in with logged SDR values without loss of accuracy. Missing values on September 8, 2011 from 0945 to 1045 during satellite monitoring equipment upgrade were interpolated from adjacent good record without loss of accuracy. Instrument calibration was supported by approximately 200 visits made to the gage by NCWCD and DWR staff. No calibration corrections were required this year. The structure is generally not operated in winter months; however, a thermostatically controlled submersible stock tank heater has been placed in the stilling well in the event that this structure were to be operated in the winter. The SE and SDR do not completely go to zero when the tunnel is not in use. Levels and flume inspection on October 9, 2007 found the inlet invert approximately 0.09 feet above the flume floor and crest. This observation is consistent with notations of positive stage readings occurring at zero flow as well as previous year's point of zero flow (PZF) stage assumptions. Note: Flume entry for cleaning or any other purpose is strictly prohibited without prior authorization and lock-out tag-out procedures as per USBR Hazardous Energy Control Program (HECP) policy (document on file).
Datum Corrections.--	Levels were last run on October 9, 2007 using the flume's crest as base. The tape was replaced on October 18, 2007 and cut to the index elevation of 19.87 ft.
Rating.--	Rating table STD08FTPFE was implemented on October 1, 2007 and was continued again this year. It is a standard 8-ft. Parshall Flume rating expanded formulaically to 5.35 feet of stage using a standard 8-ft. Parshall flume formula. In previous years, the gage had been directly measured infrequently due to considerable safety hazards. More recently as per USBR HECP policies, the structure has not been measured or observed directly as the measurement structure cannot be entered when water is actively being diverted. Mass balance computations and indirect measurements (when conditions allow) are now used to track this structure's performance. This year, six discharge measurements (Nos. 111-116) were made ranging in discharge from 119 to 412 cfs. Measurements made this year, were made during a period when the Charles Hansen Feeder Canal upstream of the Dille Tunnel delivery point was inactive and mass balance computations showed a significant imbalance in the system. All measurements were made at the HFCBBSCO site and applied back to this site using a 0.5 hour time delay. The peak flow of 468 cfs occurred at 1015 on June 8, 2011 at a gage-height of 5.31 ft. with a shift of 0 ft. It exceeded high flow Measurement No. 111 made November 18, 2010 by 56 cfs and 0.66 ft. of stage.
Discharge.--	The rating is normally directly applied to the gage-height record as per agreement with the USBR, NCWCD and the Water Commissioner. This was the case this year except for November 12 through December 1, 2010 where stage dependant shifting was used during a period where mass balance computations showed a significant imbalance in the system. Variable shift table DILTUNCOVST11-1, is defined by 6 measurements (Nos. 111-116) made during the period of use. Raw shifts ranged from 0.00 to 0.26 ft. in the positive direction. All measurements were given full weight except for: Nos. 112, 113 and 114 which were adjusted -1.4%, 1.24% and 1.90% respectively to smooth the shift distribution.

Special Computations.-- Zero flow is determined operationally. The gage-height record has been adjusted to zero residual gage-heights . Zero flow was determined to occur on part of the day or all day on the following days: October 1-12, 14-22, 25, 29- November 2; December 1, 2010 through April 28; July 23 – 29 and August 3, 2011. The DILTUNCO discharge record was compared to the HFCBBSO and BTBLES CO records for the November period listed above. Comparisons seem reasonable given the level of ambiguity occurring during this period.

Remarks.-- Discharge measurements are not made in the flume or tunnel for safety reasons. Measurement opportunities are limited at the tunnel's east portal, due to backwater from Hansen Feeder Canal. Performing measurements upstream of the tunnel diversion is not possible due to swift water conditions and excessive depth issues. Likewise, cable and Acoustic Doppler Current Profiler measurements are not possible at or near the DILTUNCO diversion. Mass balance computations and indirect measurements (when conditions allow) are used to track this structure's performance.

An opportunity to indirectly measure this structure occurred in late November, 2010; where six current meter measurements (Nos. 111-116) were made at the HFCBBSO site. The measurements made ranged in discharge from 412 to 119 cfs with unadjusted shifts ranging from +0.26 feet to 0.00 feet. No mechanism has been identified and not enough information is available to draw any conclusions regarding this structure's performance or the cause for the shifts experienced in November 2010.

The record is good except for November 12 through December 1, 2010 and the peak of June 8, 2011 which are considered fair.

Flow at this station is intermittent; dependent on river flows, C-BT water orders, and other regulations.

Station maintained and record developed by Russell V. Stroud.

Recommendations.-- Mass balance computations should be continued to monitor the gage's performance. Measurement opportunities similar to those seen in November 2010 should be watched and planned for.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

DILLE TUNNEL NEAR DRAKE

RATING TABLE-- STD08FTPFPF USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

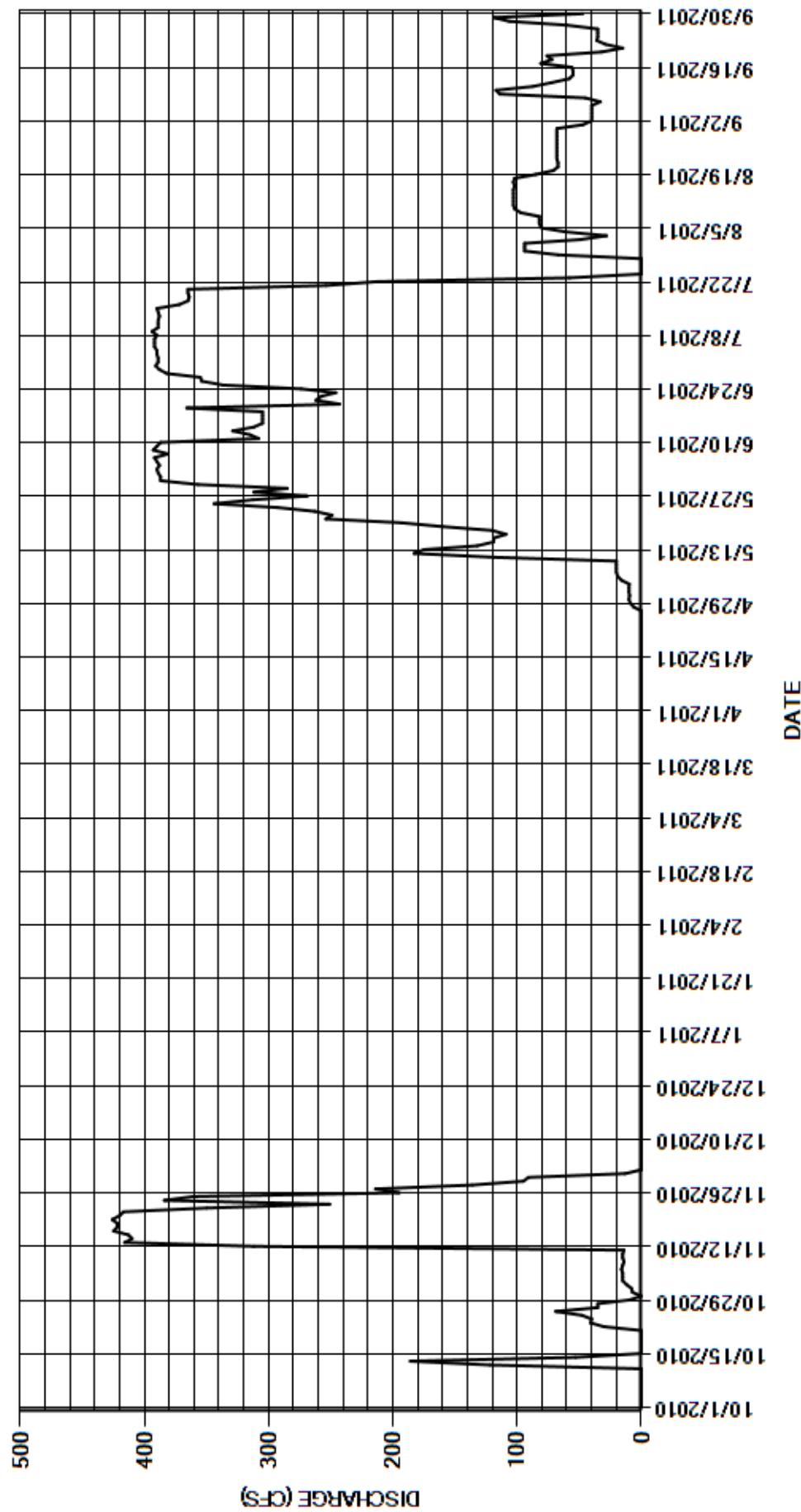
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	7.9	13	0.00	0.00	0.00	0.00	9.5	387	389	94	47
2	0.00	12	0.00	0.00	0.00	0.00	0.00	10	389	389	49	40
3	0.00	15	0.00	0.00	0.00	0.00	0.00	10	390	390	28	40
4	0.00	15	0.00	0.00	0.00	0.00	0.00	9.7	388	390	61	40
5	0.00	15	0.00	0.00	0.00	0.00	0.00	16	390	392	80	40
6	0.00	16	0.00	0.00	0.00	0.00	0.00	19	392	392	82	40
7	0.00	15	0.00	0.00	0.00	0.00	0.00	20	381	392	82	33
8	0.00	14	0.00	0.00	0.00	0.00	0.00	20	393	390	82	45
9	0.00	15	0.00	0.00	0.00	0.00	0.00	20	390	394	97	114
10	0.00	15	0.00	0.00	0.00	0.00	0.00	20	387	389	102	117
11	0.00	14	0.00	0.00	0.00	0.00	0.00	119	308	389	103	87
12	122	312	0.00	0.00	0.00	0.00	0.00	183	315	389	103	72
13	186	416	0.00	0.00	0.00	0.00	0.00	175	329	388	103	58
14	53	410	0.00	0.00	0.00	0.00	0.00	132	312	389	103	55
15	0.00	413	0.00	0.00	0.00	0.00	0.00	119	305	390	103	55
16	0.00	425	0.00	0.00	0.00	0.00	0.00	119	305	372	102	56
17	0.00	422	0.00	0.00	0.00	0.00	0.00	109	305	365	103	81
18	0.00	422	0.00	0.00	0.00	0.00	0.00	120	305	364	102	72
19	0.00	426	0.00	0.00	0.00	0.00	0.00	160	366	365	85	76
20	0.00	420	0.00	0.00	0.00	0.00	0.00	193	243	365	71	32
21	0.00	417	0.00	0.00	0.00	0.00	0.00	254	262	254	67	15
22	30	350	0.00	0.00	0.00	0.00	0.00	249	258	213	67	29
23	41	251	0.00	0.00	0.00	0.00	0.00	263	246	58	68	36
24	40	384	0.00	0.00	0.00	0.00	0.00	293	274	0.00	68	35
25	48	361	0.00	0.00	0.00	0.00	0.00	344	337	0.00	68	35
26	69	195	0.00	0.00	0.00	0.00	0.00	313	354	0.00	68	35
27	35	214	0.00	0.00	0.00	0.00	0.00	269	355	0.00	68	60
28	35	136	0.00	0.00	0.00	0.00	6.1	312	382	0.00	68	106
29	9.4	95	0.00	0.00	---	0.00	8.9	285	388	67	68	119
30	0.00	91	0.00	0.00	---	0.00	10	357	391	94	68	47
31	7.2	---	0.00	0.00	---	0.00	---	387	---	94	68	---
TOTAL	675.60	6313.9	13.00	0.00	0.00	0.00	25.00	4909.2	10227	8463.00	2481	1717
MEAN	21.8	210	0.42	0.000	0.000	0.000	0.83	158	341	273	80.0	57.2
AC-FT	1340	12520	26	0	0	0	50	9740	20290	16790	4920	3410
MAX	186	426	13	0.00	0.00	0.00	10	387	393	394	103	119
MIN	0.00	7.9	0.00	0.00	0.00	0.00	0.00	9.5	243	0.00	28	15
CAL YR	2010	TOTAL	24881.50	MEAN	68.2	MAX	426	MIN	0.00	AC-FT	49350	
WTR YR	2011	TOTAL	34824.70	MEAN	95.4	MAX	426	MIN	0.00	AC-FT	69070	

MAX DISCH: 468 CFS AT 10:15 ON JUN 08,2011 GH 5.31 FT SHIFT 0 FT

MAX GH: 5.31 FT AT 10:15 ON JUN 08,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

DILLE TUNNEL NEAR DRAKE
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06738000 BIG THOMPSON RIVER AT MOUTH OF CANYON NEAR DRAKE
Water Year 2011

Location.--	Lat. 40°25'18", Long. 105°13'34", in SW 1/4 SW 1/4 sec. 3, T, 5 N., R. 70 W., Larimer County, Hydrologic Unit 10190006, on right bank at mouth of canyon, 400 ft upstream from Handy Ditch diversion dam, and 6.0 mi east of Drake.
Drainage Area and Period of Record.--	305 mi ² . 1927-1933, 1938 to present.
Equipment.--	<p>Sutron Constant Flow Bubbler (CFB) in 6-foot by 6-foot pre-cast concrete shelter at a low head concrete dam control. A cantilever style wire weight gage located on the right edge of water near the shelter is the primary reference with no provisions for a supplemental reference. The CFB is connected to a Sutron Satlink II Data Collection Platform (DCP) at the Hansen Feeder Canal Wasteway to the Big Thompson River (HFCWASCO) via a Design Analysis H-423 (SDI-12 to RS-485 converter unit) carried by buried copper wire placed by the United States Bureau of Reclamation (USBR). A Design Analysis H-416 (SDI-12 to 4-20mA converter) is also connected to the CFB unit to provide a Supervisory Control and Data Acquisition (SCADA) output to the USBR's control center. A Tacoma style bank operated cableway was placed approximately 120-ft. upstream from the gage shelter in April 2010. Cableway installation will allow for measurement of flows that were not captured in previous years due to condemnation and subsequent removal of the manned cableway.</p> <p>This gage is operated and maintained by the Colorado Division of Water Resources (DWR) and is simultaneously used by the DWR, USBR, Northern Colorado Water Conservancy District (NCWCD) and the Home Supply Ditch Company.</p>
Hydrologic Conditions.--	Drainage area consisting of widely varying terrain, vegetative types, hardened surfaces and one substantial diversion, Dille Tunnel Near Drake, CO (DILTUNCO). Flow patterns are largely regulated by Colorado Big Thompson (C-BT) Project operations occurring upstream from this gage from Lake Estes to the DILTUNCO site. High flows encountered at this gage this year were due to higher than expected runoff inflows to Lake Estes. As a result the Bureau made larger than typical releases to the Big Thompson River. Bank inflow into the channel below the control continues to be an issue and is suspected to have increased in the past several years. Water traveling around the gage and control structures may contribute to differences seen in mass balance computations within the Big Thompson Canyon system.
Gage-Height Record.--	The primary record is 15-minute data with the CFB's independent log as backup. The record is complete and reliable, except as follows: the CFB failed to log individual values on the following days October 8, 10, 31, November 1, 2010 and March 27, April 12, 13, 18, 27, 29, May 5, 20, June 19, July 7, 12, 18, 2011. Missing values were interpolated from adjacent record. August 29 - 30, 2011 missing values were filled in using the CFB log. All missing data was filled in without loss of accuracy. November 29 - December 1 and 17 - 29, 2010, the gage was ice affected. December 29, 2010 and March 17, 2011, partial day records corresponding to instrument deactivation and activation days. December 30, 2010 – March 16, 2011, gage was shutdown for winter, no gage-height information available.
Datum Corrections.--	Levels were run on October 30, 2008 and October 15, 2009 showing corrections to the base reference of -0.051 and -0.044 feet respectively. Corrections were not made in either case in lieu of tracking movement of the gage's infrastructure. Levels run over the last several years indicate significant instability in the areas surrounding the gage as well as the control. Efforts to substantiate the instability will continue to be made. As was done in the 2010 record a -0.05 ft datum correction was applied to the entirety of the water year 2011 record.
Rating.--	The control is a concrete dam approximately 20 feet below the gage shelter. Rating No. 16 in use since October 1, 2000 was continued this year. It is defined by measurements from 4 to 2100 cfs. Flows up to about 150 cfs can be waded near the gage. Flows above the wadeable limit are measured using the Tacoma style bank operated cableway. Eleven discharge measurements (No's 350-360) were performed this year ranging in discharge from 23 to 530 cfs. The peak discharge of 1050 cfs occurred at 1300 June 7, 2011 at a gage height of 4.22 ft with a shift of 0.05 ft.
Discharge.--	Shifting control method was used all year. Measurements show unadjusted shifts ranged from -0.03 to +0.05 feet. Shifts were distributed by time for the period October 1, 2010 – April 20, 2011 as defined by measurements Nos. 350-354. Msmt Nos. 350 and 351 were adjusted 5% and 3% to smooth the shift distribution. Shifts were distributed by stage, using BTCANYCOVST11-1, from April 20 - September 1, 2011. Msmt. Nos. 356 and 359 were adjusted 3% and 1% to better fit the distribution within the variable shift table. All measurements made within the time period (354 - 360) were used in the table. From September 1, 2011 through the end of the water year and to Msmt. No 361, shifts were prorated by time.
Special Computations.--	Winter measurements are not made at this gage due to extremely heavy ice conditions. Discharge for the ice affected period (November 29 - December 1 and 17 - 29, 2010) was estimated from adjacent periods of good record and correlated to a mass balance calculation [BTABLESCO + BTNFDRCO – DILTUNCO = BTCANYCO(spreadsheet included in digital file)]. Likewise discharge for the winter period (December 29, 2010 through March 17, 2011) was computed from the mass balance calculation with respect to temperature data logged at the HFCWASCO and Big Thompson above Lake Estes (BTABESCO) gages. Reasonable agreement is illustrated from the computed BTCANYCO record and actual BTCANYCO record prior to as well as following winter operations. Winter estimation is typically correlated to the Home Supply winter diversion values; however, the Water Commissioner was unable to provide diversion data at the time of this evaluation.
Remarks.--	The record is good, except for periods of ice effect and no gage height record, which are estimated and poor. Station maintained by Russell V. Stroud and record developed by Patrick Tyler.
Recommendations.--	Strict adherence to running levels twice per year is required. The stability of the control, reference points and the Point of Zero Flow (PZF) is questionable and needs to be monitored and substantiated. Inflow immediately below the control needs to be monitored for "piping" of road base material as well as significant changes in discharge.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06738000 BIG THOMPSON RIVER AT MOUTH OF CANYON NEAR DRAKE

RATING TABLE-- BTCANYCO16 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

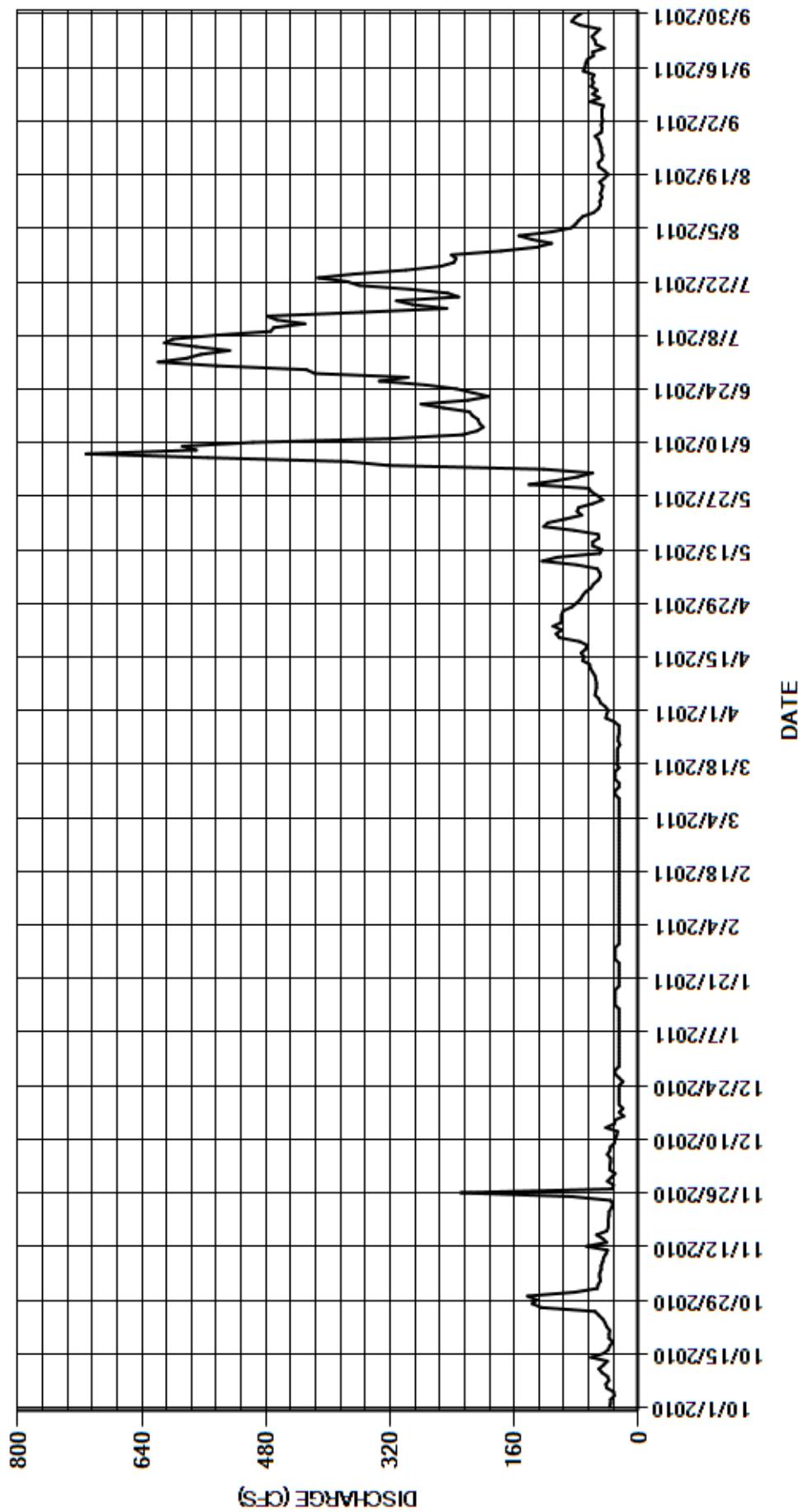
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	37	53	e30	e25	e25	e25	39	72	78	619	112	48
2	36	52	37	e25	e25	e25	43	68	59	582	137	46
3	36	49	37	e25	e25	e25	49	61	122	564	154	47
4	31	50	36	e25	e25	e25	51	58	323	527	112	47
5	32	50	36	e25	e25	e25	56	52	375	570	87	47
6	41	48	40	e25	e25	e25	55	49	555	611	81	45
7	42	48	37	e25	e25	e25	54	50	712	600	77	62
8	38	46	36	e25	e25	e25	54	53	570	544	72	50
9	40	45	31	e25	e25	e25	55	79	588	474	58	59
10	47	42	30	e25	e25	e30	56	124	497	470	52	53
11	51	40	28	e25	e25	e30	59	105	318	430	49	61
12	45	67	27	e25	e25	e25	62	50	227	466	50	58
13	40	41	42	e25	e25	e25	63	47	208	479	47	60
14	61	46	31	e30	e25	e30	72	59	200	357	49	57
15	45	54	30	e30	e25	e30	70	59	205	247	47	71
16	39	41	19	e30	e25	e30	74	51	207	291	46	69
17	37	39	e25	e30	e25	e25	68	52	214	312	50	68
18	33	39	e20	e30	e25	28	66	82	218	232	44	66
19	38	39	e25	e25	e25	27	76	122	251	246	39	58
20	38	38	e25	e25	e25	27	102	117	280	294	44	59
21	37	38	e25	e25	e25	27	106	94	220	360	51	44
22	41	35	e25	e25	e25	27	99	73	193	375	52	55
23	43	33	e25	e25	e25	24	110	79	214	413	47	56
24	46	36	e25	e25	e25	26	99	77	235	366	46	60
25	51	86	e20	e25	e25	26	99	59	274	300	48	55
26	56	229	e25	e30	e25	25	99	46	334	255	48	50
27	125	34	e30	e30	e25	25	97	52	297	238	50	75
28	137	32	e30	e30	e25	25	86	60	417	235	51	86
29	131	e40	e25	e30	---	31	80	64	428	241	56	82
30	143	e35	e25	e25	---	42	75	141	543	177	48	74
31	82	---	e25	e25	---	41	---	106	---	131	47	---
TOTAL	1699	1525	902	820	700	851	2174	2261	9362	12006	1951	1768
MEAN	54.8	50.8	29.1	26.5	25.0	27.5	72.5	72.9	312	387	62.9	58.9
AC-FT	3370	3020	1790	1630	1390	1690	4310	4480	18570	23810	3870	3510
MAX	143	229	42	30	25	42	110	141	712	619	154	86
MIN	31	32	19	25	25	24	39	46	59	131	39	44
CAL YR	2010	TOTAL	28255	MEAN	77.4	MAX	934	MIN	19	AC-FT	56040	
WTR YR	2011	TOTAL	36019	MEAN	98.7	MAX	712	MIN	19	AC-FT	71440	

MAX DISCH: 1050 CFS AT 13:00 ON JUN 07,2011 GH 4.22 FT SHIFT 0.05 FT

MAX GH: 4.22 FT AT 13:00 ON JUN 07,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06738000 BIG THOMPSON RIVER AT MOUTH OF CANYON NEAR DRAKE
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06739500 BUCKHORN CREEK NEAR MASONVILLE
Water Year 2011

Location.--	Lat. 40°26'04", Long. 105°10'47", just downstream from Larimer County Road 24H bridge over Buckhorn Creek.
Drainage Area and Period of Record.--	140 mi ² .
Equipment.--	Graphic water stage recorder, shaft encoder and Sutron High Data Rate (HDR) Data Collection Platform (DCP) in a wooden shelter and stilling well. Electric drop tape gage is the primary reference. An outside staff gage is installed but not used.
Hydrologic Conditions.--	Drainage area consists of low timber and plains drainage, with storm runoff but no high snow. Numerous rural road bridges and culverts span the creek.
Gage-Height Record.--	The primary record is telemetered 15-minute data with chart as backup. The record is complete and reliable, except for the following days when the gage was affected by ice: January 1-2, 10-12, 2011, February 1-4, 8-11, 2011. One encoder calibration correction of -0.01 ft was made on January 25, 2011.
Datum Corrections.--	Levels were last run in 2000.
Rating.--	Low and medium water control is concrete with two 6-inch by 8-inch treated timbers bolted to the top of the concrete. The channel slopes up from this control towards the right bank. Higher stages also flow through the left (east) side of the bridge. Control at high stages is influenced by the willows, shrubs and trees on the right side, and by the channel conditions downstream of the concrete dam. The dam submerges at high flows. Rating BUCRMVCO10 is defined to about 300 cfs. Rating BUCRMVCO11 was developed this water year and applied to the whole year. It is the same as Rating 10 at lower stages and is an extension of Rating 10 using high flow measurements made in WY99. There appears to be a break in the rating due to the change in control at higher flows. Thirteen measurements (Nos. 644 - 656) were made this water year ranging in discharge from 1.24 to 55.8 cfs. They cover the range in stage experienced this year well, except for the rain events of June 9, July 7-8 and 13, 2011. These rain events were above any flows measured since 1999. The instantaneous peak flow of 920 cfs occurred at 0115 July 13, 2011 at a gage height of 8.99 ft with a shift of +0.08 ft. It exceeded the stage of high Measurement No. 654 taken the same morning by 3.39 feet. This peak was a rain event and was a very sharp 'spike' which only lasted a few hours.
Discharge.--	Shifting control method was used all year. Shifts are caused by material on the control at low stages and by variable effects of vegetation when the flow spreads out around the timber control. Shifts were distributed by time proration from the beginning of the water year until 1030 Apr 26 2011; and from 1315 Aug 22 2011 to the end of the water year. Variable stage-shift relationship, BUCRMVCOVST11-2, was used from 1045 April 26 to 1300 August 22 and is based on measurements made during this period. Measurements showed unadjusted shifts ranged from 0.00 to +0.08 feet.
Special Computations.--	Discharges for the ice affected days were estimated by interpolating from days of good gage height on both sides of the affected periods.
Remarks.--	The record is good, except for periods of ice effect which are estimated and poor. The peak is considered poor due to lack of recent measurements to confirm the upper end of the rating. Daily discharges above the highest measured discharge of 55.8 cfs are considered poor due to lack of rating definition. Station maintained by Mark Simpson and record developed by Lee Cunning.
Recommendations.--	Outside readings are needed for measurements and visits, so the unreadable outside staff needs to be repaired or replaced. The control needs to be extended to the east where water is going around the timber. A full set of levels need to be run, re-marking all BM's. The station description needs to be updated with secondary BM information and photos.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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06739500 BUCKHORN CREEK NEAR MASONVILLE

RATING TABLE-- BUCRMVCO011 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.6	1.7	1.3	e1.3	e1.5	1.3	1.9	4.4	19	7.8	4.7	1.6
2	1.5	1.7	1.3	e1.3	e1.5	1.3	1.9	4.1	18	8.4	4.6	1.8
3	1.6	1.7	1.3	1.2	e1.5	1.3	2.2	3.4	18	7.6	4.5	1.9
4	1.5	1.6	1.3	1.3	e1.5	1.3	2.4	3.5	17	6.5	4.6	1.8
5	1.4	1.4	1.4	1.3	1.5	1.3	2.5	3.7	17	6.0	4.2	1.8
6	1.5	1.3	1.3	1.3	1.5	1.3	2.7	3.6	16	8.6	3.7	1.8
7	1.5	1.4	1.4	1.3	1.5	1.3	2.8	3.5	15	68	3.3	2.3
8	1.4	1.5	1.3	1.3	e1.5	1.4	2.9	3.3	14	66	2.7	2.1
9	1.4	1.5	1.3	1.5	e1.4	1.4	2.7	3.3	92	27	2.6	1.9
10	1.4	1.5	1.3	e1.5	e1.4	1.3	2.6	3.3	37	18	2.6	1.8
11	1.4	1.5	1.3	e1.5	e1.3	1.2	2.5	4.3	27	15	2.5	1.7
12	1.5	1.5	1.3	e1.5	1.3	1.2	2.5	5.8	20	13	2.3	1.6
13	1.4	1.5	1.3	1.3	1.3	1.3	2.6	5.2	18	115	2.3	1.6
14	1.4	1.4	1.3	1.2	1.3	1.3	3.5	3.7	17	38	2.4	1.9
15	1.3	1.3	1.3	1.2	1.3	1.4	3.3	6.3	16	26	2.3	2.5
16	1.3	1.3	1.3	1.2	1.3	1.5	3.6	6.7	14	19	2.2	2.0
17	2.1	1.3	1.3	1.3	1.3	1.5	3.2	5.8	14	17	2.2	1.9
18	1.8	1.3	1.2	1.3	1.3	1.5	3.1	7.9	13	13	2.0	1.8
19	1.7	1.3	1.2	1.3	1.3	1.8	3.5	31	13	11	2.0	1.7
20	1.6	1.3	1.2	1.2	1.4	1.9	4.6	33	21	11	2.0	1.6
21	1.5	1.3	1.2	1.3	1.3	1.9	5.4	32	24	10	1.9	1.6
22	1.6	1.3	1.1	1.3	1.2	1.9	5.3	34	19	9.0	1.7	1.6
23	1.7	1.3	1.1	1.3	1.2	2.0	5.4	35	17	8.0	1.7	1.5
24	1.5	1.3	1.1	1.2	1.2	2.1	4.8	37	15	7.1	1.6	1.4
25	1.5	1.3	1.1	1.2	1.3	2.1	4.3	36	13	6.5	1.6	1.4
26	1.6	1.3	1.1	1.4	1.3	2.1	4.8	34	9.9	7.0	1.6	1.3
27	1.9	1.3	1.1	1.5	1.3	2.1	5.2	30	8.6	7.0	1.6	1.3
28	1.9	1.3	1.1	1.5	1.3	2.1	5.2	22	8.1	7.3	1.7	1.3
29	1.8	1.3	1.1	1.5	---	2.1	4.8	24	6.8	8.1	1.9	1.3
30	1.7	1.3	1.1	1.5	---	2.0	4.5	25	7.3	6.6	1.9	1.4
31	1.7	---	1.2	1.5	---	1.9	---	22	---	5.3	1.7	---
TOTAL	48.7	42.0	38.2	41.5	38.0	50.1	106.7	476.8	564.7	583.8	78.6	51.2
MEAN	1.57	1.40	1.23	1.34	1.36	1.62	3.56	15.4	18.8	18.8	2.54	1.71
AC-FT	97	83	76	82	75	99	212	946	1120	1160	156	102
MAX	2.1	1.7	1.4	1.5	1.5	2.1	5.4	37	92	115	4.7	2.5
MIN	1.3	1.3	1.1	1.2	1.2	1.2	1.9	3.3	6.8	5.3	1.6	1.3

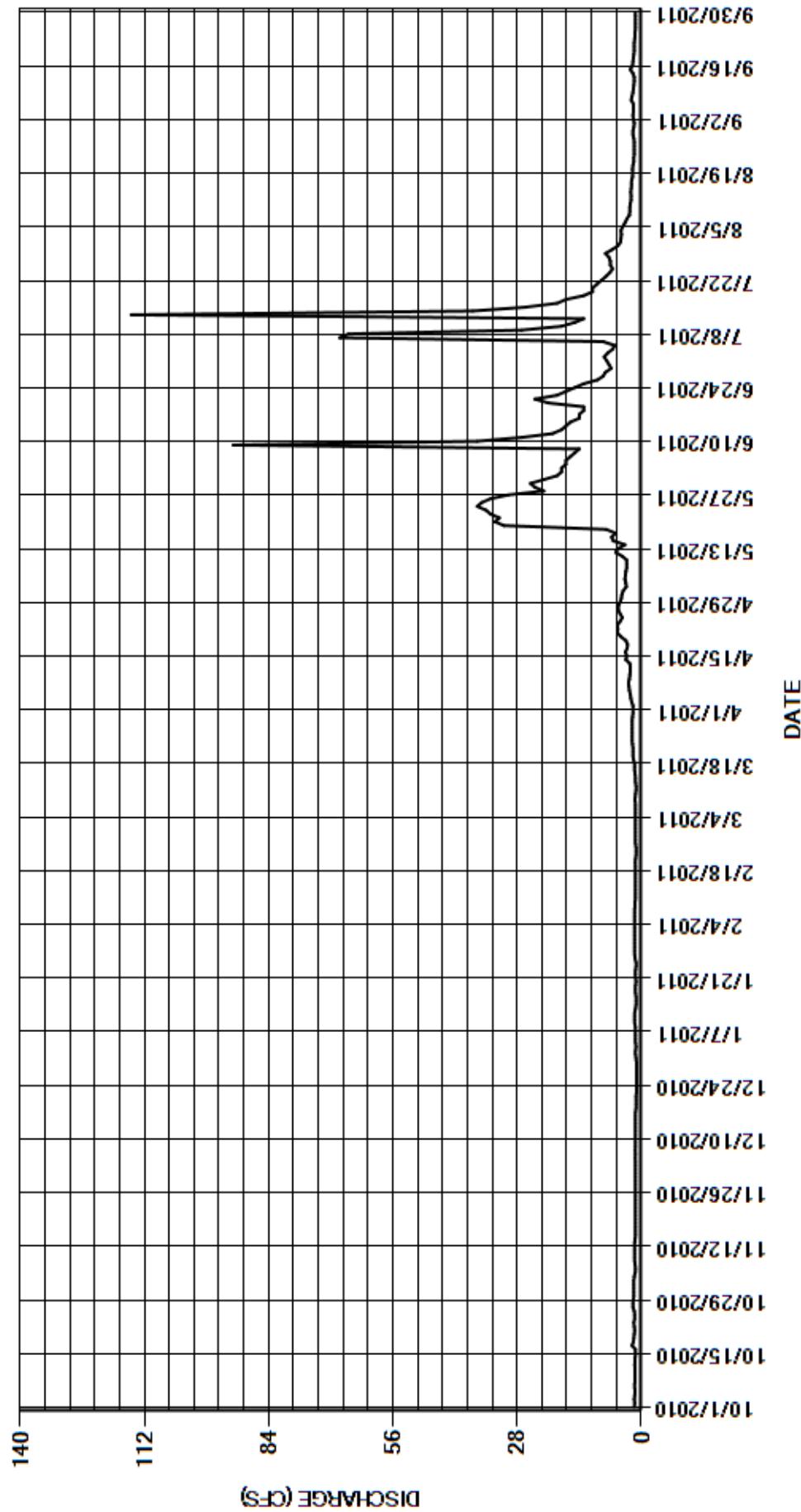
CAL YR	2010	TOTAL	7011.2	MEAN	19.2	MAX	189	MIN	1.1	AC-FT	13910
WTR YR	2011	TOTAL	2120.3	MEAN	5.81	MAX	115	MIN	1.1	AC-FT	4210

MAX DISCH: 920 CFS AT 01:15 ON JUL 13,2011 GH 8.99 FT SHIFT 0.08 FT

MAX GH: 8.99 FT AT 01:15 ON JUL 13,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06739500 BUCKHORN CREEK NEAR MASONVILLE
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
CHARLES HANSEN FEEDER CANAL BELOW BIG THOMPSON SIPHON
Water Year 2011

Location.--	Lat. N40° 25'24.38", Long. W105° 13'35.81" (NAD83). Gage is located on the left side of a trapezoidal concrete canal approximately 300 ft. down canal from the Big Thompson Siphon and 4.5 mi south of Masonville, CO or 8 mi. west of Loveland, CO.
Drainage Area and Period of Record.--	The Charles Hansen Feeder Canal conveys water released from Flatiron Reservoir and occasionally diverted water from the Big Thompson River via Dille Tunnel to terminal storage at Horsetooth Reservoir. Several diversions occur throughout the Charles Hansen Feeder Canal from its release point at Flatiron Reservoir to its final delivery point at Horsetooth Reservoir with one inflow, Dille Tunnel. Daily values are available from January 1, 1951 to present.
Equipment.--	Digital incremental Sutron SDR-0001-4 shaft encoder connected to a Sutron SatLink2 Data Collection Platform (DCP) transmitting hourly in a 4-ft. by 4-ft. concrete shelter and stilling well at a trapezoidal concrete canal section. The stilling well is connected to the canal by two 3-in. inlets with flushing equipment. An electric tape gage placed on the instrument shelf is the primary reference with no provisions for a supplemental reference. AC power is available at the gage and heaters are used to keep the stilling well from freezing in winter months. The gage is maintained in cooperation of the United States Bureau of Reclamation (USBR), the Northern Colorado Water Conservancy District (NCWCD) and the Colorado Division of Water Resources (DWR) as a component of the Colorado Big Thompson (C-BT) project. A Sutron 8210 DCP and Design Analysis H-334 shaft encoder were removed and the gage was placed in the above configuration on July 12, 2011.
Hydrologic Conditions.--	Trapezoidal concrete canal with regulated releases from Flatiron Reservoir (HFCFLTCO) and Dille Tunnel (DILTUNCO). The Charles Hansen Feeder Canal conveys water released from Flatiron Reservoir and occasionally diverted water from the Big Thompson River via Dille Tunnel to terminal storage at Horsetooth Reservoir. Several diversions occur throughout the Charles Hansen Feeder Canal from its release point at Flatiron Reservoir to its final delivery point at Horsetooth Reservoir with one inflow, Dille Tunnel.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data and 5-minute logged SDR data as backup. Frequent visits by NCWCD and DWR personnel showed good agreement between sensor and base gage. The record is complete and reliable except for: November 29 through December 1, 2010 when the stage-discharge relationship was affected by ice and April 14-21, 2011 when the stage-discharge relationship was affected by heavy algal growth in the canal and possibly an obstruction in a downstream siphon. Missing values on July 12, 2011 from 1345 to 1630 during satellite monitoring equipment upgrade were interpolated from adjacent good record without loss of accuracy. One instrumentation correction of +0.01 ft. was made on May 2, 2011.
Datum Corrections.--	Levels were last run on May 31, 2007 using B.M.1 as base. No correction was necessary
Rating.--	The low flow control is the first fire protection check structure in the canal downstream from the gage. The control for mid to high flows is the canal itself. Rating No. 17, in use since 2005 was continued this year and is defined by measurement from 13 to 503 cfs. Nine discharge measurements (Nos. 817-825) were made during the year, ranging in discharge from 119 to 519 cfs. The peak flow of 537 occurred at 0715 on July 19, 2011 at a gage-height of 6.60 ft. with a shift of 0.00 ft. It exceeded high flow Measurement No. 525 by 18 cfs and 0.17 ft. of stage.
Discharge.--	Historically, the rating has been directly applied to the gage-height record to compute discharge. This was the case this year from October 1 - November 11, 2010, December 2, 2010 - March 12, 2011 and April 13 - September 30, 2011. Stage dependent shifting using variable shift table HFCBBSCOVST11-1 was used from November 12 - December 1, 2010 and shifting control method was used from March 13 - April 12, 2011.
Special Computations.--	Open water measurements showed raw shifts varying between -0.88 to +0.12 ft. Variable shift table HFCBBSCOVST11-1 is defined by six measurements (Nos. 817-822) made during the period of use. All measurements were given full weight except for Nos. 818, 819 and 821 which were adjusted up to 1% to smooth the shift distribution. Measurement No. 823 (April 9, 2011) was made during a period of heavy algal growth throughout the canal system. The shift was applied by time starting on March 13, 2011 and given full weight at the time of the measurement. NCWCD and USBR staff dewatered the canal and directly treated the algal growth on April 12, 2011. During this action a 10-ft. diameter stock water tank was retrieved from a location downstream of the gage. Based on it's condition it is suspected that the tank had been lodged in a siphon and may have lead to some degree of back water at the gage.
Special Computations.--	Computed discharges for the period immediately following algal growth treatment (April 14-21, 2011) did not agree well with mass balance computations of the system. This period was estimated from the Charles Hansen Feeder Canal Below Flatiron Reservoir (HFCFLTCO) gage as there were no other diversions away from or into the canal system during this period.
	Discharge for the ice affected period (November 29 – December 1, 2010) was estimated from the Dille Tunnel Near Drake, CO (DILTUNCO) record. Dille was the only feature contributing water to the system for all of November 29 and 30 and part of December 1, 2010.
	Zero flow is determined operationally. Residual gage-heights of 0.10 ft. remain in the well when there is no active diversion occurring. Sustained gage-height of 0.10 ft. and below occurring on September 16 and 30, 2011 were adjusted to -0.01 ft. to zero discharge computations. The discharge records of this and the DILTUNCO site for the month of November were closely examined and compared. Similarly the discharge record for this site was compared to the HFCFLTCO site to determine the period that algal growth began to affect the stage-discharge relationship.

Remarks.--

The record is good, except for November 29 – December 1, 2010 when the gage was ice affected, which is estimated and poor; March 13 – April 13, 2011 when the stage-discharge relationship was affected by algal growth and potentially a stock water tank lodged in a downstream siphon, which is poor; and April 14-21, 2011 when the computed discharge record was in poor agreement with mass balance computations of the system which is estimated and poor. Station maintained and record developed by Russell V. Stroud.

Recommendations.--

The USBR has procured a Acoustic Doppler Velocity Meter (ADVM) for this site to better quantify flows at this site and to help in mass balance computations of the system. Opportunities are being watched for installation of this instrument.

The gage should be watch for algal growth accumulating in the canal system. If algal growth is noted the USBR and NCWCD should be notified immediately.

Discharge measurements throughout the entire range of flows throughout the year should be made. Successful use of the ADCP indicates that it should be used here when conditions allow.

The electric tape gage is beginning to fall into disrepair. It should be replaced in the 2012 Water Year.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

CHARLES HANSEN FEEDER CANAL BELOW BIG THOMPSON SIPHON

RATING TABLE-- HFCBBSCO17 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

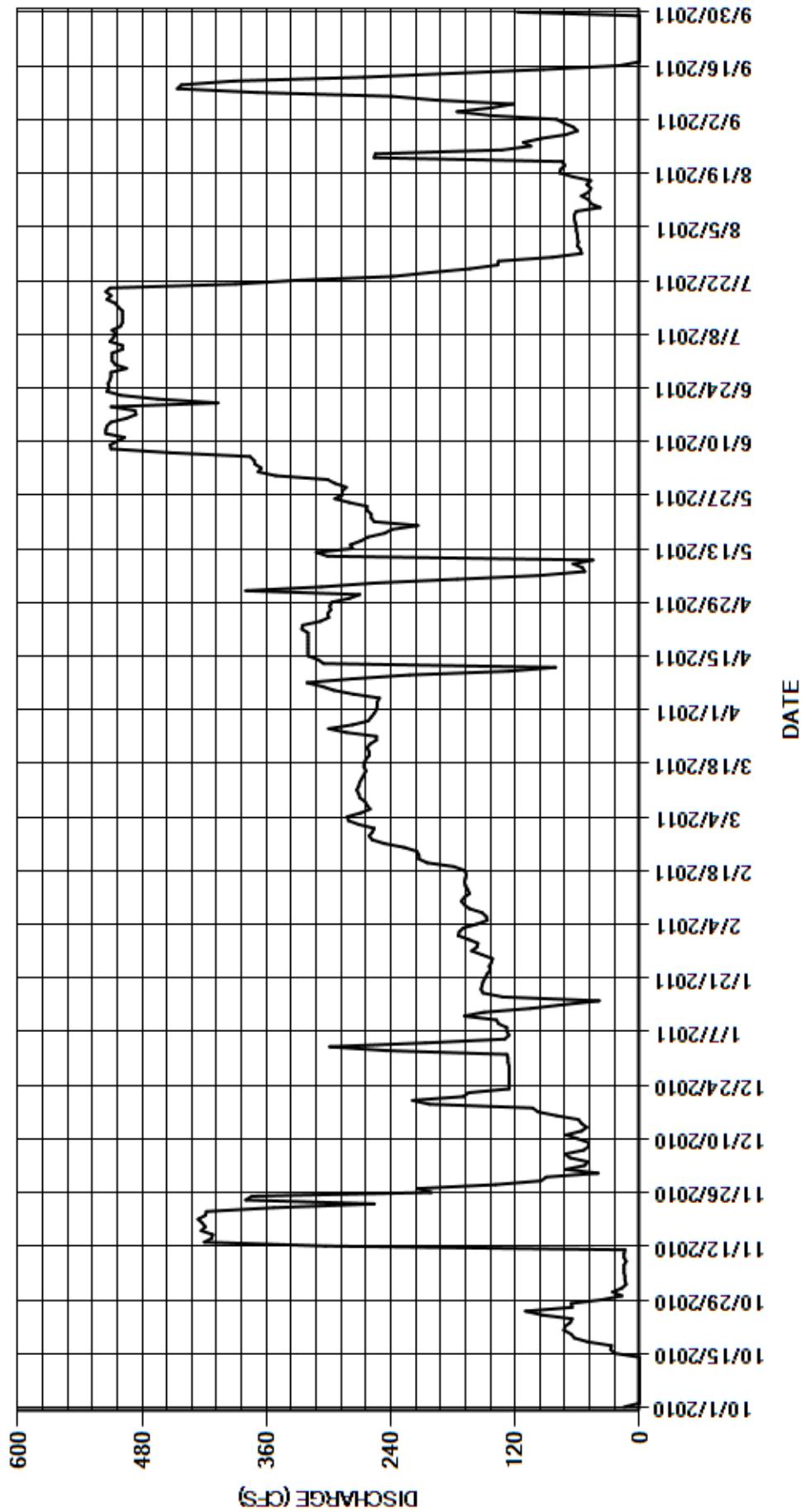
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	17	e40	128	175	256	254	270	351	509	59	73
2	0.00	13	71	244	174	271	253	380	368	509	60	80
3	0.00	14	53	299	170	281	253	307	365	509	60	144
4	0.00	14	50	207	157	282	251	256	371	499	61	176
5	0.00	15	67	130	147	269	276	176	372	499	61	143
6	0.00	15	72	126	148	260	295	95	376	511	62	122
7	0.00	15	54	128	152	263	306	53	453	508	63	196
8	0.00	13	49	128	164	265	321	55	510	505	63	239
9	0.00	15	49	136	169	270	277	64	511	509	61	369
10	0.00	15	60	138	172	271	222	45	504	501	38	446
11	0.00	14	71	169	169	273	126	301	497	499	47	442
12	0.00	303	56	150	164	271	81	312	515	499	49	392
13	0.00	420	51	105	166	270	305	277	515	499	56	266
14	0.00	413	56	73	168	268	e310	279	514	499	49	179
15	24	412	59	39	169	266	e320	269	510	503	47	93
16	28	423	80	132	168	264	e320	262	495	506	51	20
17	27	419	98	151	167	266	e320	246	486	514	47	0.00
18	50	422	103	153	169	266	e320	239	487	510	64	0.00
19	63	426	203	152	179	264	e320	214	510	515	77	0.00
20	66	419	219	151	205	261	e320	256	407	511	76	0.00
21	73	418	170	149	213	261	e320	259	465	390	72	0.00
22	72	353	165	147	213	263	326	259	501	331	75	0.00
23	67	256	126	144	215	260	325	263	514	238	256	0.00
24	65	380	126	145	227	254	308	263	512	203	255	0.00
25	94	374	126	143	246	254	300	280	513	164	133	0.00
26	110	201	126	142	258	283	301	294	511	137	105	0.00
27	65	214	126	152	261	300	298	287	510	136	112	0.00
28	66	139	126	162	258	277	299	287	510	84	95	0.00
29	36	e95	126	157	---	262	297	283	495	56	71	0.00
30	17	e90	127	156	---	259	280	294	506	57	60	118
31	26	---	127	165	---	256	---	301	---	60	64	---
TOTAL	964.00	6337	3032	4601	5243	8286	8504	7426	14154	11970	2449	3498.00
MEAN	31.1	211	97.8	148	187	267	283	240	472	386	79.0	117
AC-FT	1910	12570	6010	9130	10400	16440	16870	14730	28070	23740	4860	6940
MAX	110	426	219	299	261	300	326	380	515	515	256	446
MIN	0.00	13	40	39	147	254	81	45	351	56	38	0.00
CAL YR	2010	TOTAL	79189.00	MEAN	217	MAX	513	MIN	0.00	AC-FT	157100	
WTR YR	2011	TOTAL	76464.00	MEAN	209	MAX	515	MIN	0.00	AC-FT	151700	

MAX DISCH: 537 CFS AT 07:15 ON JUL 19,2011 GH 6.60 FT SHIFT 0 FT

MAX GH: 6.60 FT AT 07:15 ON JUL 19,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CHARLES HANSEN FEEDER CANAL BELOW BIG THOMPSON SIPHON
WY2011 HYDROGRAPH



PLATTE RIVER BASIN

06738100 CHARLES HANSEN FEEDER CANAL WASTEWAY TO BIG THOMPSON

Water Year 2011

Location.--	Lat. N40° 25'14.24", Long. W105° 13'32.15" (NAD83). Gage is located on the right side of a modified 15-ft. Parshall Flume 4.6 mi. south of Masonville, CO and 8 mi. west of Loveland, CO.
Drainage Area and Period of Record.--	Delivery and safety feature for the Charles Hansen Feeder Canal delivering water from the feeder canal to the Big Thompson River. Daily values are available from October 1, 1953 to September 30, 1979 and October 1, 1990 to present.
Equipment.--	Digital incremental Sutron SDR-0001-4 shaft encoder and a Vaisala WXT520 multi-parameter weather sensor connected to a Sutron SatLink2 Data Collection Platform (DCP) transmitting hourly in a 4-ft. by 4-ft. concrete shelter and stilling well at a modified concrete 15-ft. Parshall flume. An electric tape gage placed on the instrument shelf is the primary reference with a supplemental staff gage located on the flume's left wing wall at the Ha location. The well is connected to the flume by two 2 -in. inlets with flushing equipment. A timber measurement bridge is located upstream of the Ha location in the converging section of the flume. The gage is operated in cooperation with the United States Bureau of Reclamation (USBR), the Northern Colorado Water Conservancy District (NCWCD) and the Colorado Division of Water Resources (DWR) as a component of the Colorado Big Thompson (C-BT) project. The satellite monitoring equipment (Sutron 8210 DCP, Design Analysis H-334 shaft encoder, and SDR-0001-1) was removed and upgraded to the above configuration on July 12, 2011.
Hydrologic Conditions.--	Semi controlled release often experiencing rapid changes and transient flow. The Charles Hansen Feeder Canal conveys water from Flatiron Reservoir to Horsetooth Reservoir. Several diversions occur throughout the Charles Hansen Feeder Canal from its release point at Flatiron Reservoir to its final delivery point at Horsetooth Reservoir with one inflow, Dille Tunnel. The HFCWASCO structure serves double duty as both a delivery structure as well as a safety feature for the Hansen Feeder Canal System within the C-BT system. As a delivery structure, due to the placement of the Big Thompson Power Plant (BTPPMCCO) and the Handy Ditch company's diversion structure, water cannot be routed through the BTPPMCCO structure and then subsequently delivered to the Handy Ditch. Additionally, when the BTPPMCCO plant is unavailable for power generation water can be routed through the HFCWASCO structure for subsequent diversion downstream of the HFCWASCO and Big Thompson River's confluence point. In addition to performing as a water delivery structure, the HFCWASCO structure is used as a safety mechanism. In the event that the BTPPMCCO plant were to trip offline, water intended to pass through the BTPPMCCO plant would quickly overtop the Hansen Feeder Canal upstream from the plant. Therefore, the Supervisor Control and Data Acquisition (SCADA) system will open three slide gates located in the Hansen Feeder Canal conveying water into the wasteway. The same event would occur if a blockage was detected in the Big Thompson Siphon located immediately downstream from the HFCWASCO diversion point. In the event that the SCADA procedure were to fail or be delayed in slide gate activation, a siphonic spillway also located immediately upstream of the Big Thompson Siphon radial gate can convey water into the wasteway structure. However, water introduced via the siphonic spillway comes in below the flume's crest and therefore cannot be quantified by this structure.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data and 5-minute SDR data as backup. Frequent visits by NCWCD and DWR show good agreement between sensor and base gages. The record is complete and reliable except for: July 12 through August 30, 2011 where multiple and frequent power failures plagued the SDR's performance. Multiple instrument corrections were made during this period ranging from 0.55 to -1.75 ft. before the cause of the corrections was identified. The instrument's performance became increasingly unreliable from August 24 to 30, 2011 when the issue was resolved. Missing values occurring on October 8, 2010 and August 21, 2011 were interpolated by adjacent record without loss of accuracy. Missing values on July 12, 2011 from 1100 to 1300 during satellite monitoring equipment upgrade were interpolated from adjacent good record without loss of accuracy.
Datum Corrections.--	Levels were last run on April 3, 2008 using the flume's crest of base. The electric tape gage was replaced and re-indexed to an elevation of 15.095 ft. at this time. The gage and control are both stable and do not require frequent level validation.
Rating.--	The control is a modified 15-ft. Parshall Flume with an upstream baffle box. Rating HFCWASCO02, is a standard 15-ft. Parshall Flume rating up to a gage-height of 2.10 ft. and customized upward based on measurement made prior to 1972. One discharge measurement (No. 110) was made this year at a gage-height of 0.53 ft. and a discharge of 21.0 cfs returning a computed shift of 0.00 ft. The peak flow of 528 cfs occurred at 1045 on May 9, 2011 at a gage-height of 3.80 ft. using a 0.00 ft. shift.
Discharge.--	The rating was directly applied to the gage-height record to compute discharge. As per agreement with the USBR, NCWCD and the Water Commissioner, measurements within 5% of the rating have been adjusted to zero. Previous measurements Nos. 107, 108 and 109 made in the 2006, 2007, and 2009 water years were adjusted to the rating requiring adjustments of 3%, 4%, and -2% respectively. This year's measurement did not require any adjustment.
Special Computations.--	Discharges from August 24 through 30, 2011 when the SDR's operation was significantly affected were estimated from known periods of good record and visits made to the gage by NCWCD, USBR and DWR staff. Zero flow is determined operationally. Due to the placement of the inlets of the structure, residual water remains in the stilling well thereby recording false positive stage values following dewatering of the structure. In previous years, it had been determined that sustained stages of 0.05 feet and below is a resultant of residual water in the stilling well. This hypothesis was confirmed by an in-flume inspection on April 3, 2008. Sustained gage-heights of 0.05 ft. and below occurring on October 9, 10, 12 2010 and September 28- 30, 2011 were adjusted to 0.00 ft.

Remarks--

The record is good, except for July 12 through August 23 which is fair and August 24 through 30, 2011 which is estimated and poor. Any flows introduced to this structure via the siphonic spillway were not and could not be recorded by this structure. The Siphonic spillway was known to be active on May 20, 2011 when the Big Thompson Power Plant tripped offline and the slide gates at the HFCWASCO facility could not be opened and again on May 25, 2011 when HFCWASCO slide gate automatic activation sensors were being tested. Station maintained and record developed by Russell V. Stroud.

Recommendations--

Mass balance computations of the Hansen Feeder Canal System may be able to identify and quantify siphonic spillway usage. This has not been evaluated by CDWR as of yet. A safety evaluation of the timber measurement bridge by a qualified engineer should be preformed prior to performing any further cable discharge measurements from it.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06738100 CHARLES HANSEN FEEDER CANAL WASTEWAY TO BIG THOMPSON

RATING TABLE-- HFCWASCO02 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

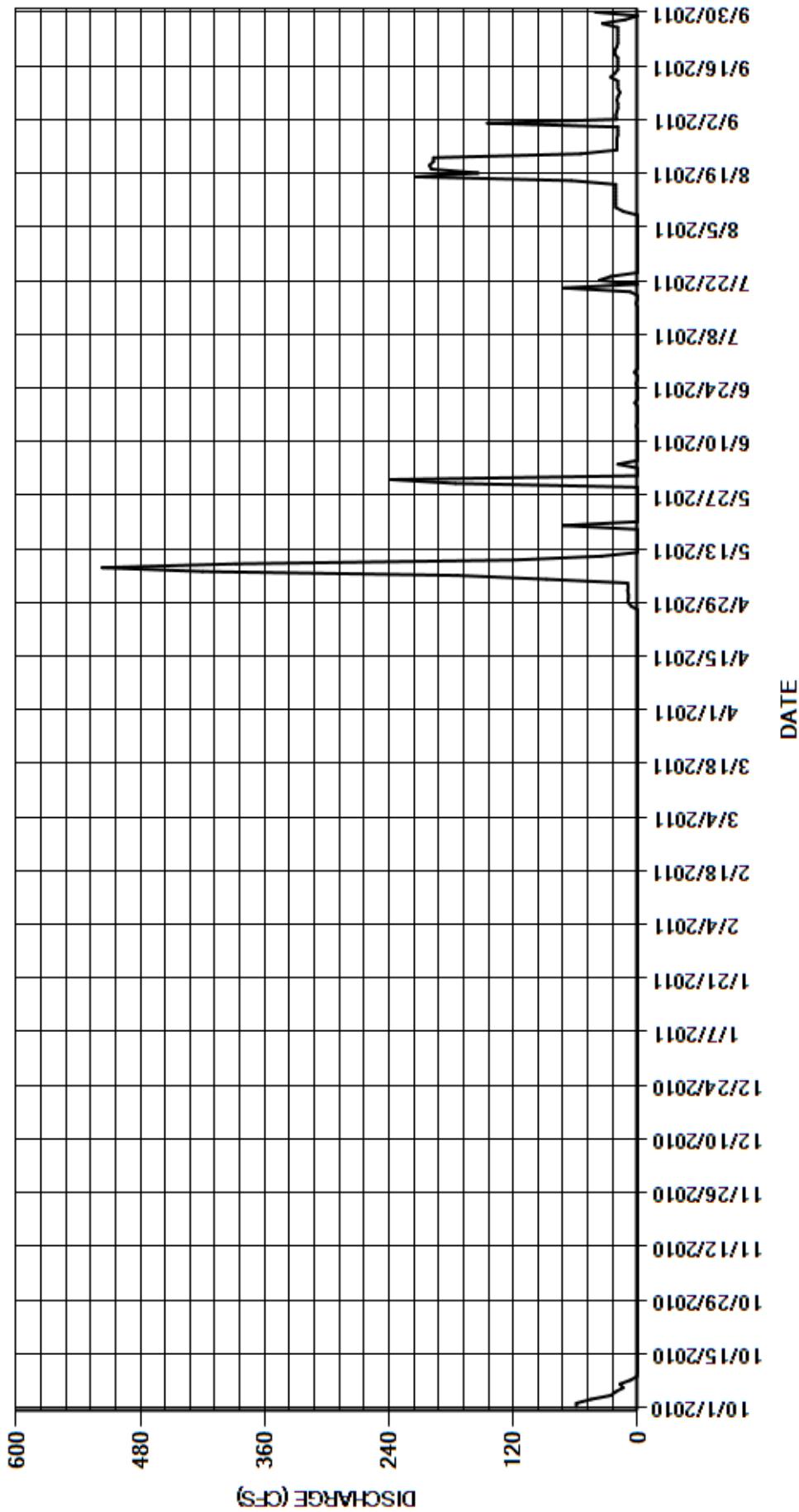
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	59	0.00	0.00	0.00	0.00	0.00	0.00	8.9	0.00	0.00	0.00	145
2	59	0.00	0.00	0.00	0.00	0.00	0.00	9.6	0.00	0.00	0.00	20
3	45	0.00	0.00	0.00	0.00	0.00	0.00	9.2	0.00	0.12	0.00	21
4	26	0.00	0.00	0.00	0.00	0.00	0.00	9.7	19	0.00	0.00	20
5	21	0.00	0.00	0.00	0.00	0.00	0.00	88	0.00	0.00	0.00	19
6	14	0.00	0.00	0.00	0.00	0.00	0.00	174	0.00	0.00	0.00	19
7	17	0.00	0.00	0.00	0.00	0.00	0.00	420	0.00	0.00	0.00	20
8	6.8	0.00	0.00	0.00	0.00	0.00	0.00	517	0.00	0.00	0.00	19
9	0.51	0.00	0.00	0.00	0.00	0.00	0.00	388	0.00	0.00	0.00	17
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	120	0.00	0.00	0.00	19
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35	0.00	0.00	0.00	19
12	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.1	0.00	0.00	22
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.4	0.00	19
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	64	19
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	214	19
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	72	0.00	7.1	154	22
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.6	71	199	22
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	201	20
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37	197	19
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26	197	19
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e55	19
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	0.00	e20	19
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e20	19
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e20	34
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.3	0.00	3.0	0.00	e20
29	0.00	0.00	0.00	0.00	---	0.00	9.3	0.00	0.00	0.00	e19	0.00
30	0.00	0.00	0.00	0.00	---	0.00	9.0	176	0.00	0.00	e19	41
31	0.00	---	0.00	0.00	---	0.00	---	238	---	0.00	19	---
TOTAL	248.50	0.00	0.00	0.00	0.00	0.00	24.60	2265.40	27.00	142.64	1579.00	727.00
MEAN	8.02	0.000	0.000	0.000	0.000	0.000	0.82	73.1	0.90	4.60	50.9	24.2
AC-FT	493	0	0	0	0	0	49	4490	54	283	3130	1440
MAX	59	0.00	0.00	0.00	0.00	0.00	9.3	517	19	71	214	145
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAL YR	2010	TOTAL	2791.92	MEAN	7.65	MAX	144	MIN	0.00	AC-FT	5540	
WTR YR	2011	TOTAL	5014.14	MEAN	13.7	MAX	517	MIN	0.00	AC-FT	9950	

MAX DISCH: 528 CFS AT 10:45 ON MAY 09,2011 GH 3.80 FT SHIFT 0 FT

MAX GH: 3.80 FT AT 10:45 ON MAY 09,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06738100 CHARLES HANSEN FEEDER CANAL WASTEWAY TO BIG THOMPSON
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
USBR POWER PLANT AT BIG THOMPSON CANYON MOUTH
Water Year 2011

Location.--	Lat. N40° 25'15.44", Long. W105° 13'23.43" (NAD83). Power plant facility is located on the right bank of the Big Thompson River 4.5 mi. south of Masonville, CO and 8 mi. west of Loveland, CO.
Drainage Area and Period of Record.--	Controlled release from the Charles Hansen Feeder Canal to the Big Thompson River. Waters transmitted via the Power Plant facility originated at or in part from either Flatiron Reservoir or the Dille Tunnel (DILTUNCO) diversion, both of which convey water to the Hansen Feeder Canal upstream from the Power Plant. Waters passed through the Power Plant facility enter the Big Thompson River downstream from the Big Thompson at Canyon Mouth (BTCANYCO) gage, Charles Hansen Feeder Canal Wasteway to Big Thompson River (HFCWASCO) delivery point, and the Handy Ditch diversion structure (WDID: 0400521). Daily values are available from October 1, 1997 to present.
Equipment.--	Sutron 8210 Data Collection Platform (DCP) connected to an ultrasonic flow meter placed on the upper scroll casing of the power turbine. A graphical discharge recorder is also connected to the flow meter but has been disabled over the last few years. Power plant facilities are operated and maintained by the United States Bureau of Reclamation (USBR). Satellite telemetry equipment is maintained by Colorado Division of Water Resources (DWR) staff.
Hydrologic Conditions.--	Controlled release from the Charles Hansen Feeder Canal to the Big Thompson River. Waters transmitted via the Power Plant facility originated at or in part from either Flatiron Reservoir or the Dille Tunnel (DILTUNCO) diversion, both of which convey water to the Hansen Feeder Canal upstream from the Power Plant. Waters passed through the Power Plant facility enter the Big Thompson River downstream from the Big Thompson at Canyon Mouth (BTCANYCO) gage, Charles Hansen Feeder Canal Wasteway to Big Thompson River (HFCWASCO) delivery point, and the Handy Ditch diversion structure (WDID: 0400521).
Gage-Height Record.--	The primary record is 15-minute telemetered discharge values measured from the ultrasonic instrument. The record is complete and reliable, except for February 27 through May 10, 2011 when the DCP was not operational and May 11, 2011 when the flow meter was out of calibration. The hydroelectric unit was not operable during the inoperable DCP period. As such, values were adjusted to zero without loss of accuracy. Discharge values for May 10 and 11, 2011 when the flow meter was out of calibration were taken from USBR accounting.
Datum Corrections.--	Not applicable.
Rating.--	Primary data is discharge, no rating is needed. A ultrasonic flow meter is installed on the turbine's upper scroll casing. No calibration information is available on the meter. However, available information on the meter indicates that the meter (when calibrated correctly) should be within two percent of actual flow. The power plant discharges directly into the river; water can also be diverted and delivered to the river by either the HFCWASCO or Handy Ditch structures immediately upstream from the power plant. Thus, there are no opportunities to perform comparison measurements. Peak discharge for the water year was recorded by the flow meter to be 406 cfs occurring at 0330 July 17, 2011.
Discharge.--	Discharge for the year was computed from the telemetered flow meter data except for May 9-11, 2011 which were taken from USBR provided accounting. Transmitted values were checked against water orders issued by the USBR as well as USBR monthly accounting information provided to the DWR office. Computed values were found to be in excellent agreement with USBR accounting. Negligible daily (+/- 1cfs) discrepancies occur between the computed record evaluated here and USBR provided accounting. Discrepancies are assumed to be caused by precision or rounding differences between the two methods of computation. Maximum monthly differences totaled less than 2cfs per month.
Special Computations.--	Indirect validation method of the power plant record began in WY 2006 when a mass balance calculator was developed to help quantify the individual gage accuracies and to monitor diversions to and deliveries from the Charles Hansen Feeder Canal system. The calculations indicated that some submergence and variable backwater issues existed at Hansen Feeder Canal below Flatiron Reservoir (HFCFLTCO) gage. In the 2008 water year the USBR purchased and installed an Acoustic Doppler Velocity Meter (ADVM) for the HFCFLTCO gage. Mass Balance computations made since installation of the ADVM unit (under certain flow regimes) have shown good agreement with all gages in the Hansen Feeder Canal system, including the power plant.
Remarks.--	The record is good, except for May 9-11, 2011 when the DCP was malfunctioning and the ultrasonic flow meter was out of calibration which is fair. Daily discharges were taken from USBR accounting which uses a mass balance technique to compute flow through the plant. Despite the inability for direct confirmatory discharge measurements, indirect measurement methods show the instrument to be accurate. Record developed by Russell V. Stroud.
Recommendations.--	Mass balance computations need to be continued to ensure operational accuracy. The USBR has procured a new more accurate ultrasonic flow meter for this site. Installation is anticipated to occur in April, 2012. Likewise a new ADVM site is slated to be established at a site upstream of the trifurcation in an attempt to better quantify flows in the canal below Flatiron Reservoir. A velocity indexed rating needs to be created at the upstream site alluded to above or at the HFCFLTCO site. Once complete, a robust mass balance analysis should be performed on the Charles Hansen Feeder Canal system.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

USBR POWER PLANT AT BIG THOMPSON CANYON MOUTH

RATING TABLE.-- STCONVERT USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

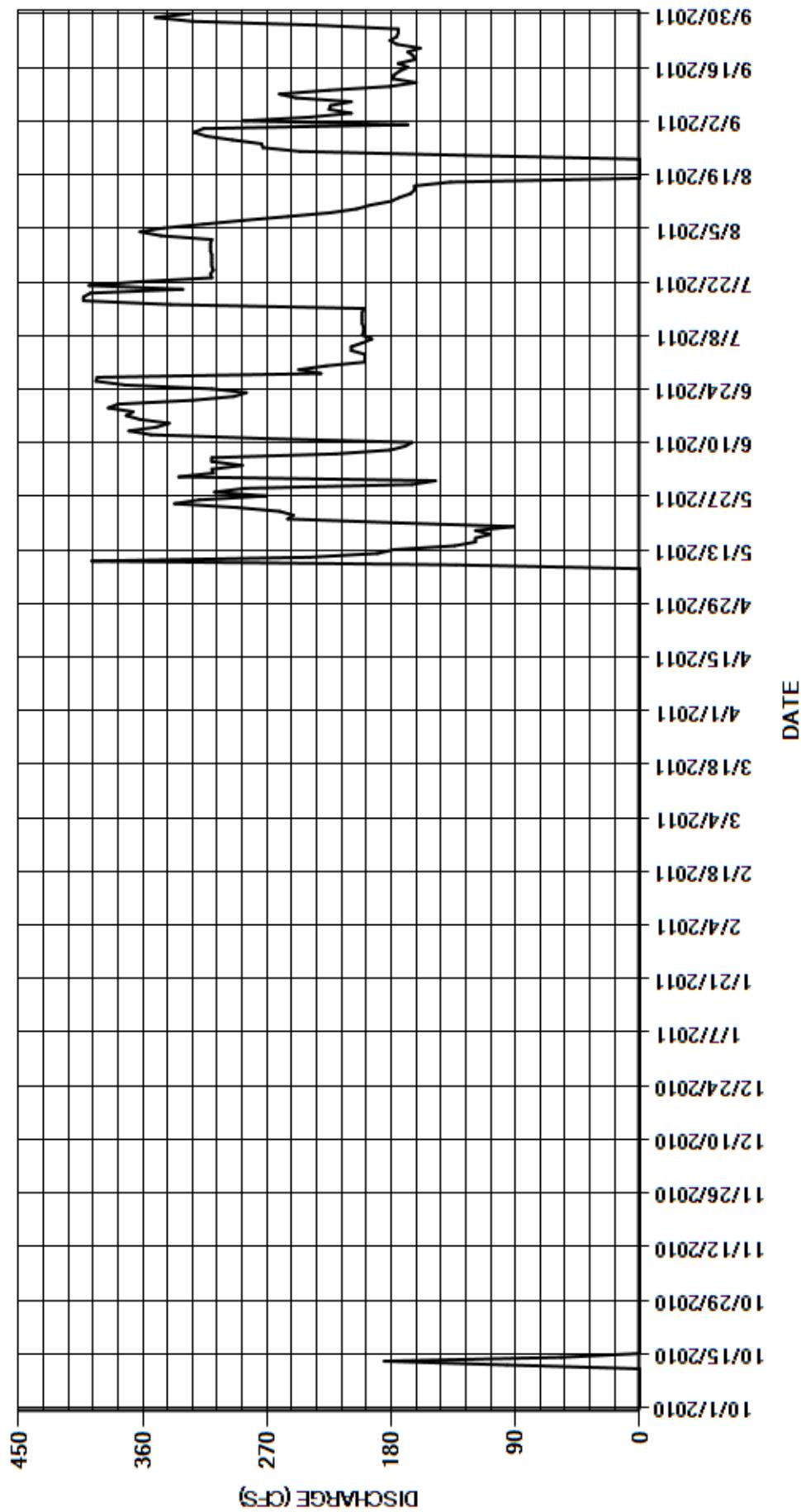
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	334	199	311	168
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	309	199	310	287
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	310	199	347	238
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	288	209	362	209
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	310	209	345	225
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	310	201	316	224
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	220	194	287	209
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	181	201	255	249
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	133	170	200	224	261
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	397	165	200	205	225
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	239	270	201	195	181
12	96	0.00	0.00	0.00	0.00	0.00	0.00	190	354	201	180	162
13	185	0.00	0.00	0.00	0.00	0.00	0.00	178	370	201	174	179
14	57	0.00	0.00	0.00	0.00	0.00	0.00	134	350	201	166	178
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	119	341	200	163	174
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	119	362	340	163	168
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	108	372	403	137	175
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	119	367	403	0.00	163
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	91	385	398	0.00	164
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	177	378	331	0.00	168
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	255	324	399	0.00	159
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	251	294	362	0.00	176
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	261	285	310	0.00	181
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	292	310	311	127	176
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	337	373	309	246	175
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	319	394	310	273	175
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	271	393	310	274	235
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	308	231	310	295	324
29	0.00	0.00	0.00	0.00	---	0.00	0.00	286	247	310	314	351
30	0.00	0.00	0.00	0.00	---	0.00	0.00	165	227	311	323	326
31	0.00	---	0.00	0.00	---	0.00	---	148	---	311	316	---
TOTAL	338.00	0.00	0.00	0.00	0.00	0.00	0.00	4897.00	9224	8443	6308.00	6285
MEAN	10.9	0.000	0.000	0.000	0.000	0.000	0.000	158	307	272	203	210
AC-FT	670	0	0	0	0	0	0	9710	18300	16750	12510	12470
MAX	185	0.00	0.00	0.00	0.00	0.00	0.00	397	394	403	362	351
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	165	194	0.00	159
CAL YR	2010	TOTAL	31563.00	MEAN	86.5	MAX	394	MIN	0.00	AC-FT	62610	
WTR YR	2011	TOTAL	35495.00	MEAN	97.2	MAX	403	MIN	0.00	AC-FT	70400	

MAX DISCH: 406 CFS AT 03:30 ON JUL 17,2011 (Flow Meter)

MAX GH: 0.00 FT

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

USBR POWER PLANT AT BIG THOMPSON CANYON MOUTH
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
BOULDER CREEK FEEDER CANAL NEAR LYONS
Water Year 2011

Location.--	Lat 40°12'58", long 105°15'28", NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 20, T.3 N., R.70 W., Boulder County, about 0.2 miles east of Lyons, CO.
Drainage Area and Period of Record.--	N/A.
Equipment.--	Sutron Stage Discharge Recorder (SDR) connected to a Sutron Satlink 1 Data Collection Platform (DCP) in a rectangular 6 ft by 8 ft precast concrete shelter at a 10 foot concrete Parshall flume with Ha stilling well. Northern Colorado Water Conservancy District (NCWCD) operates a Sutron 56-0540 incremental shaft encoder (record may be available upon request of the NCWCD) at the gage. The primary reference is an electric tape gage (ETG) located in the shelter with a supplemental staff located at the Ha location on the right wing wall of the flume. The gage is operated in cooperation with the NCWCD and the State of Colorado Division of Water Resources (CDWR).
Hydrologic Conditions.--	The Boulder Feeder Canal is a component of the water delivery system of the Colorado Big Thompson (C-BT) system and is owned and operated by the NCWCD. The Saint Vrain Supply Canal conveys water from Carter Reservoir to the Saint Vrain and Boulder Creek drainages. Water is measured at the Saint Vrain Supply Canal (15-foot Parshall flume) at Lyons, CO (SVSLYOCO) before bifurcating. Water bifurcating can be delivered to either the Saint Vrain Creek downstream from the Saint Vrain Creek at Lyons CO (SVCLYOCO) gage and/or can be delivered to the Boulder Feeder Canal (BFCLYOCO) via an inverted siphon under Hwy 66. Water delivered into the BFCLYOCO daylights approximately 200-feet upstream in a linear fashion (allowing sufficient stilling) from the 10-foot Parshall flume. After passing through the Parshall flume water again enters an inverted siphon before being conveyed to terminal storage in Boulder and Coal Ridge Reservoirs through both open and buried sections of canal. Back water from the downstream siphon is not an issue.
Gage-Height Record.--	The primary record is 15-minute telemetered SDR data with NCWCD data as backup. The record is complete and reliable, except for several positive daily values were recorded November 19-28, 2010 after the canal had been shut down for the winter. Positive stage during this period are suspected to be the floats set on the floor of the station to prevent freezing in the well. Instrument calibration was supported by 143 visits made by NCWCD and CDWR staff to the gage this year. Three instrument corrections were made and were all +/- 0.01 feet. This structure is not operated in winter months. Diversions were discontinued on November 1, 2010 and resumed again on April 9, 2011. The DCP was winterized on November 28, 2010 and reactivated on March 26, 2011. In preparation of the winter the NCWCD removes the instrument floats from the stilling well prior to pumping the stilling well out.
Datum Corrections.--	Levels are normally run by NCWCD personnel each spring from the ETG to the flume and adjusted by NCWCD personnel accordingly. There is no indication that NCWCD personnel performed levels this year. However, levels were run by DWR staff in the 2006 water year and found to be within allowable tolerances.
Rating.--	The control is a 10 foot Parshall flume. Rating No. 2, a non-standard rating, in use since October 1, 1977, compensates for abnormal approach conditions and was continued this year. Moss growth upstream of the flume does occur in late July through September which can cause velocity loss in the approach section and may cause negative shifting. Four discharge measurements (Nos. 168-171) were made this water year ranging in discharge from 37.2 to 73.3 cfs. Discharge measurements made this year as well as two observations of zero flow cover most of the range in stage experienced, except for higher daily flows on October 1-19, 2010; May 5-10, July 7. August 29-31 and September 1-15, 2011. The peak flow of 191 cfs occurred at 1030 September 7, 2011 at a gage height of 2.64 feet with a shift of 0.00 ft. It exceeded Msmt. No. 168 made October 5, 2010 by 1.17 feet of stage and 118 cfs.
Discharge.--	Discharge measurements within 5% of the rating have historically been adjusted to the rating as per agreement with NCWCD and the Water Commissioner. Measurements made this water year showed unadjusted shifts of -0.03 to 0.00 feet. Msmt. No. 168 made on October 5, 2010 was discounted -3%. Discharge was computed by applying the rating directly to gage height record.
Special Computations.--	Direct comparison of BFCLYOCO computed discharge values to those at the SVSLYOCO structure are made. Computed discharge at the BFCLYOCO gage should never exceed those at the SVSLYOCO gage.
Remarks.--	The record is good. Station maintained and record developed by Russell V. Stroud.
Recommendations.--	Levels should be run in WY2012 to verify ETG stability and flume levelness. Opportunities to perform discharge measurements at the low and high stage extremes should be continued to be watched for. An Acoustic Doppler Current Profiler (ADCP) vs. current meter measurement validation exercise could be attempted. Five-minute NCWCD GH's used for back-up need to be obtained yearly from Patti Gill at NCWCD in a CSV file.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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BOULDER CREEK FEEDER CANAL NEAR LYONS

RATING TABLE-- BFCLYOCO02 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

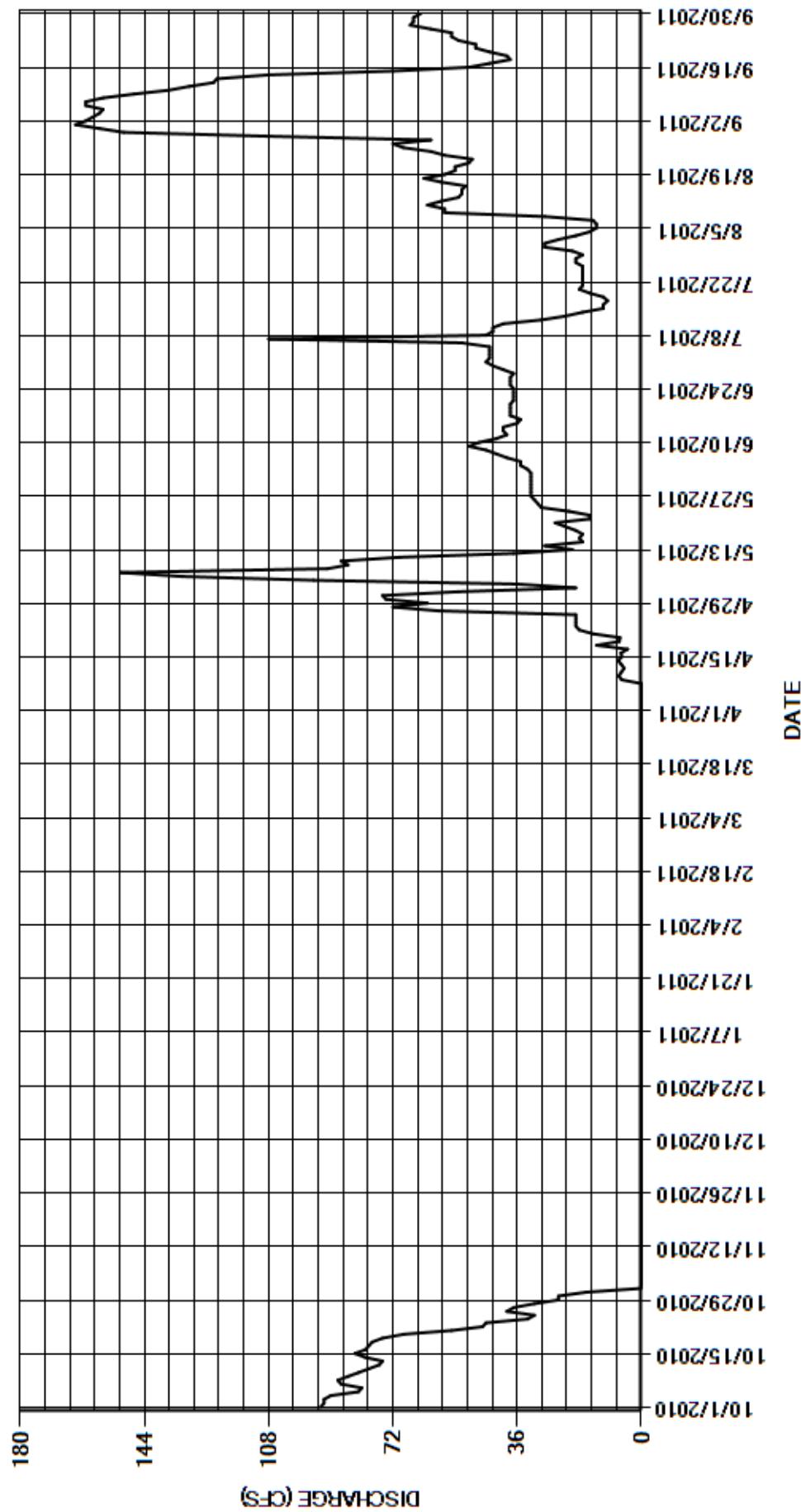
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	93	0.17	0.00	0.00	0.00	0.00	0.00	75	32	45	28	164
2	92	0.00	0.00	0.00	0.00	0.00	0.00	53	32	44	24	161
3	92	0.00	0.00	0.00	0.00	0.00	0.00	19	33	44	19	159
4	90	0.00	0.00	0.00	0.00	0.00	0.00	36	35	44	15	157
5	82	0.00	0.00	0.00	0.00	0.00	0.00	95	35	44	13	156
6	81	0.00	0.00	0.00	0.00	0.00	0.00	133	39	52	13	161
7	87	0.00	0.00	0.00	0.00	0.00	0.00	151	42	108	14	161
8	88	0.00	0.00	0.00	0.00	0.00	0.00	91	45	45	28	156
9	85	0.00	0.00	0.00	0.00	0.00	5.7	85	50	43	57	147
10	82	0.00	0.00	0.00	0.00	0.00	6.5	87	47	43	57	137
11	79	0.00	0.00	0.00	0.00	0.00	5.8	70	42	40	62	131
12	76	0.00	0.00	0.00	0.00	0.00	5.0	37	39	29	58	124
13	75	0.00	0.00	0.00	0.00	0.00	5.8	20	40	22	53	123
14	80	0.00	0.00	0.00	0.00	0.00	6.7	28	40	17	52	108
15	83	0.00	0.00	0.00	0.00	0.00	5.7	17	36	11	52	72
16	80	0.00	0.00	0.00	0.00	0.00	5.9	18	35	11	51	50
17	79	0.00	0.00	0.00	0.00	0.00	4.0	17	38	9.8	58	44
18	78	0.00	0.00	0.00	0.00	0.00	13	19	38	11	63	38
19	75	0.00	0.00	0.00	0.00	0.00	6.4	22	38	15	57	39
20	69	0.00	0.00	0.00	0.00	0.00	6.2	25	38	18	54	44
21	55	0.00	0.00	0.00	0.00	0.00	14	15	37	17	54	48
22	46	0.00	0.00	0.00	0.00	0.00	18	15	37	17	50	48
23	45	0.00	0.00	0.00	0.00	0.00	19	21	37	17	49	53
24	33	0.00	0.00	0.00	0.00	0.00	19	29	37	17	57	55
25	31	0.00	0.00	0.00	0.00	0.00	19	30	38	17	61	55
26	39	0.00	0.00	0.00	0.00	0.00	19	31	38	17	69	61
27	37	0.00	0.00	0.00	0.00	0.00	59	32	38	19	72	67
28	31	0.00	0.00	0.00	0.00	0.00	72	32	37	19	61	66
29	24	0.00	0.00	0.00	---	0.00	62	32	40	17	109	66
30	24	0.00	0.00	0.00	---	0.00	74	32	43	20	150	64
31	16	---	0.00	0.00	---	0.00	---	32	---	28	157	---
TOTAL	2027	0.17	0.00	0.00	0.00	0.00	451.70	1399	1156	900.8	1717	2915
MEAN	65.4	0.006	0.000	0.000	0.000	0.000	15.1	45.1	38.5	29.1	55.4	97.2
AC-FT	4020	0.3	0	0	0	0	896	2770	2290	1790	3410	5780
MAX	93	0.17	0.00	0.00	0.00	0.00	74	151	50	108	157	164
MIN	16	0.00	0.00	0.00	0.00	0.00	0.00	15	32	9.8	13	38
CAL YR	2010	TOTAL	10825.57	MEAN	29.7	MAX	193	MIN	0.00	AC-FT	21470	
WTR YR	2011	TOTAL	10566.67	MEAN	28.9	MAX	164	MIN	0.00	AC-FT	20960	

MAX DISCH: 191 CFS AT 10:30 ON SEP 07,2011 GH 2.64 FT SHIFT 0 FT

MAX GH: 2.64 FT AT 10:30 ON SEP 07,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

BOULDER CREEK FEEDER CANAL NEAR LYONS
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
SAINT VRAIN SUPPLY CANAL NEAR LYONS, CO
Water Year 2011

Location.--	Lat 40°13'05", long 105°15'35", NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 20, T.3 N., R.70 W., Boulder County, about 0.2 miles east of Lyons, CO.
Drainage Area and Period of Record.--	N/A.
Equipment.--	Sutron Stage Discharge Recorder (SDR) connected to a Sutron Satlink Data Collection Platform (DCP) in a 36-inch corrugated metal pipe shelter overtop a 3-foot square concrete stilling well at a 15-foot concrete Parshall flume. Northern Colorado Water Conservancy District (NCWCD) operates a Sutron incremental shaft encoder and Stevens Type A continuous chart recorder (record may be available upon request of the NCWCD) at the gage. The primary reference is an electric tape gage (ETG) located on the instrument shelf with a supplemental staff gage located at the Ha location on the right wing wall of the flume. A foot bridge spans the flume with its upstream edge placed at the Ha location. The gage is operated in cooperation of the NCWCD and the State of Colorado Division of Water Resources (CDWR).
Hydrologic Conditions.--	The Saint Vrain Supply Canal is a component of the water delivery system of the Colorado Big Thompson (C-BT) system and is owned and operated by the NCWCD. The Saint Vrain Supply Canal conveys water from Carter Reservoir to the Saint Vrain and Boulder Creek basins. Releases are measured at the Saint Vrain Supply Canal at Lyons CO (SVSLYOCO) gage before bifurcation. Bifurcated water can be delivered to either the Saint Vrain Creek downstream from the Saint Vrain Creek at Lyons CO (SVCLYOCO) gage and/or delivered to the Boulder Feeder Canal (BFCLYOCO) for terminal storage in Boulder Reservoir. The diversionary point is located downstream from the SVSLYOCO gage below an inverted siphon under Hwy 66. There are several minor diversions along the Saint Vrain Supply Canal before the SVSLYOCO gage (15-foot Parshall flume) location. Water conveyed from Carter Reservoir daylights approximately 0.25 miles upstream from the flume on a hillside due north of the gage. From this point the canal drops down a steep gradient chute into the flume's forebay resulting in high velocity surging flow and unsteady stage at the gage. A small diversionary point for water deliveries to the Supply Ditch is also located in the SVSLYOCO forebay. Backwater from the inverted siphon immediately downstream from the flume has not been observed.
Gage-Height Record.--	The primary record is 15-minute telemetered SDR data with NCWCD shaft encoder as backup. The record is complete and reliable, except for stage values of 0.08 feet and below occurring from October 31-November 21, 2010. In previous years, residual positive stage with observations of no flow has been observed to occur at a stage of 0.08 feet and below. Water was first run starting on April 9, 2011, with the gage's initial SDR calibration visit made subsequently on April 11, 2011 where no correction was made. Instrument calibration was supported by 161 visits made by NCWCD and DWR staff to the gage this year. NCWCD readings on the DWR instrument were not used for calibration, but the DWR and NCWCD data sets were compared directly. Primary (DWR) and back-up (NCWCD) data agreed to within +/-0.02 ft. The record has high reliability. This structure is not operated in winter months. Diversions were discontinued on October 31, 2010 and resumed again on April 9, 2011. The DCP was winterized on November 21, 2010 and reactivated on March 26, 2011.
Datum Corrections.--	Levels are normally run by NCWCD personnel each spring from the ETG to the flume crest and adjusted by NCWCD personnel accordingly. Levels were last known to be run by both NCWCD and DWR staff in the 2005 water year and were found to be within allowable tolerances.
Rating.--	The control is a 15 foot Parshall flume. Rating No. 5, a non-standard rating, in use since October 1, 1978, was continued this year. Rating No. 5 compensates for abnormal high approach velocities resulting from the steep gradient concrete canal chute above the flume. Due to the aging condition of the canal, increased approach velocities seem to be somewhat offset by friction losses upstream of the flume. Four discharge measurements (Nos. 174 - 177) were made during the year ranging in discharge from 36.7 to 209 cfs, which along with two observations of zero flow cover a majority of the range in discharge experienced this year. The peak flow of 497 cfs occurred at 1900 May 7, 2011 at a gage height of 3.70 feet with a shift of 0.00 ft. It exceeded Msmt. No. 176 made August 22, 2011 by 1.54 feet of stage.
Discharge.--	Discharge measurements within 5% of the rating are adjusted to the rating (zero shift) as per agreement with NCWCD and the Water Commissioner. WY2011 measurements showed unadjusted shifts of -0.02 to 0.00 feet. Measurements were adjusted up to 3% to zero. Discharge was computed by applying the rating directly to gage height record.
Special Computations.--	Discharge for periods (October 31-November 21, 2010) when stage was found to be sustained at 0.08 feet and below was adjusted to zero.
Remarks.--	The record is good. Station maintained and record developed by Russell V. Stroud.
Recommendations.--	Run levels in WY2012 to verify ETG calibration and flume levelness.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SAINT VRAIN SUPPLY CANAL NEAR LYONS, CO

RATING TABLE-- SVSLYOCO05 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

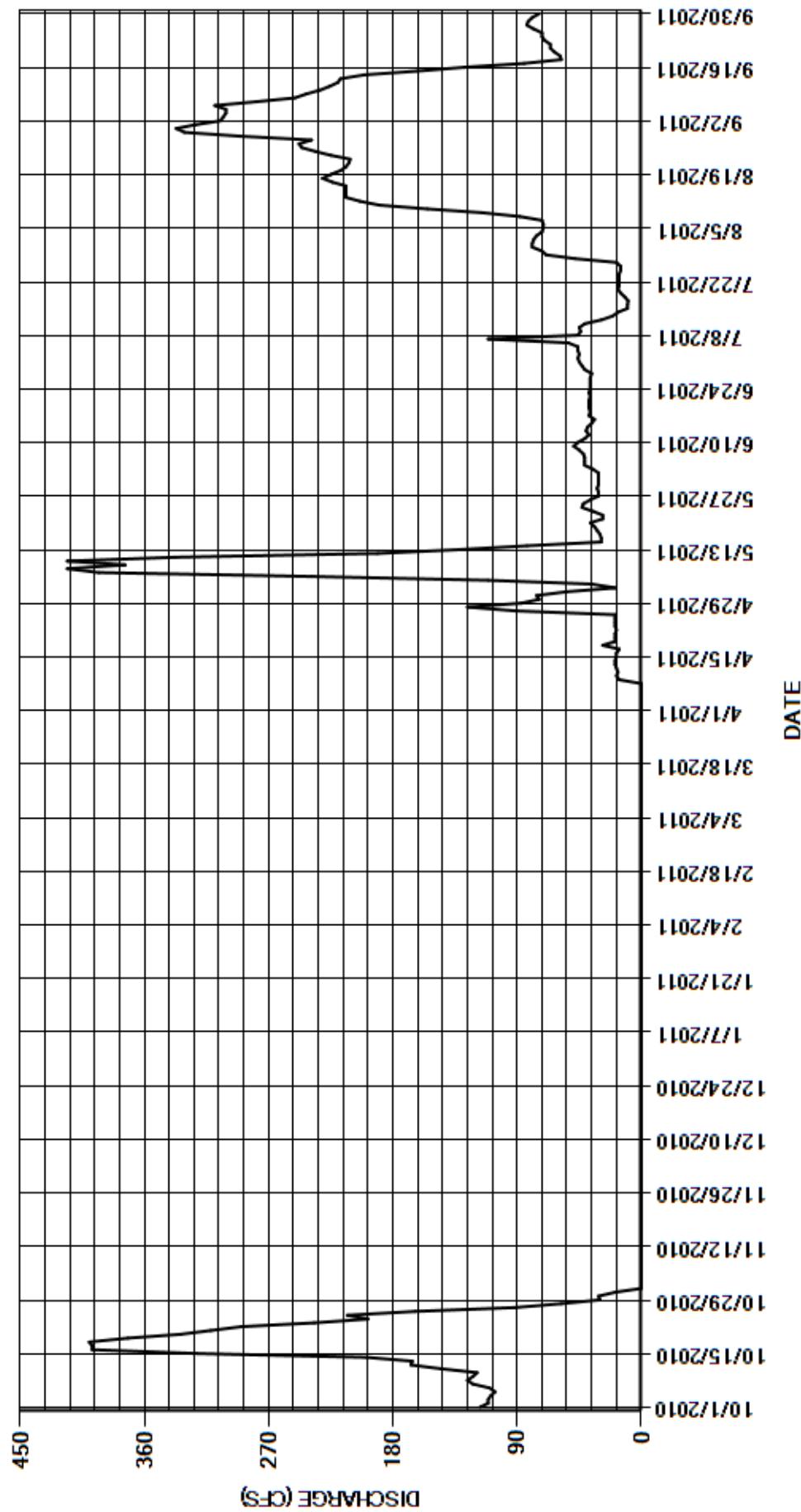
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	117	0.00	0.00	0.00	0.00	0.00	0.00	76	31	45	79	323
2	111	0.00	0.00	0.00	0.00	0.00	0.00	54	31	46	78	305
3	111	0.00	0.00	0.00	0.00	0.00	0.00	19	35	45	76	303
4	109	0.00	0.00	0.00	0.00	0.00	0.00	36	41	46	72	301
5	106	0.00	0.00	0.00	0.00	0.00	0.00	111	41	46	71	301
6	110	0.00	0.00	0.00	0.00	0.00	0.00	239	41	53	71	309
7	122	0.00	0.00	0.00	0.00	0.00	0.00	393	42	111	72	279
8	126	0.00	0.00	0.00	0.00	0.00	0.00	416	45	46	88	251
9	122	0.00	0.00	0.00	0.00	0.00	16	374	49	44	115	243
10	119	0.00	0.00	0.00	0.00	0.00	18	416	46	45	155	233
11	145	0.00	0.00	0.00	0.00	0.00	17	338	41	41	190	226
12	167	0.00	0.00	0.00	0.00	0.00	18	191	38	29	204	220
13	166	0.00	0.00	0.00	0.00	0.00	19	132	40	21	214	218
14	199	0.00	0.00	0.00	0.00	0.00	19	83	39	17	214	201
15	322	0.00	0.00	0.00	0.00	0.00	18	29	36	10	214	162
16	398	0.00	0.00	0.00	0.00	0.00	18	29	34	10	214	128
17	398	0.00	0.00	0.00	0.00	0.00	16	30	38	9.6	224	85
18	400	0.00	0.00	0.00	0.00	0.00	28	32	37	12	231	58
19	372	0.00	0.00	0.00	0.00	0.00	19	34	38	15	225	59
20	334	0.00	0.00	0.00	0.00	0.00	19	37	38	17	218	63
21	312	0.00	0.00	0.00	0.00	0.00	19	28	38	16	214	66
22	290	0.00	0.00	0.00	0.00	0.00	18	28	37	16	212	66
23	237	0.00	0.00	0.00	0.00	0.00	19	35	38	16	211	70
24	198	0.00	0.00	0.00	0.00	0.00	19	43	37	16	225	72
25	213	0.00	0.00	0.00	0.00	0.00	19	42	37	15	236	72
26	164	0.00	0.00	0.00	0.00	0.00	19	37	37	15	246	78
27	92	0.00	0.00	0.00	0.00	0.00	92	31	37	18	248	83
28	58	0.00	0.00	0.00	0.00	0.00	126	31	36	48	239	82
29	30	0.00	0.00	0.00	---	0.00	87	32	41	69	291	79
30	31	0.00	0.00	0.00	---	0.00	74	31	43	72	331	74
31	19	---	0.00	0.00	---	0.00	---	31	---	79	337	---
TOTAL	5698	0.00	0.00	0.00	0.00	0.00	717.00	3438	1162	1088.6	5815	5010
MEAN	184	0.000	0.000	0.000	0.000	0.000	23.9	111	38.7	35.1	188	167
AC-FT	11300	0	0	0	0	0	1420	6820	2300	2160	11530	9940
MAX	400	0.00	0.00	0.00	0.00	0.00	126	416	49	111	337	323
MIN	19	0.00	0.00	0.00	0.00	0.00	0.00	19	31	9.6	71	58
CAL YR	2010	TOTAL	24688.60	MEAN	67.6	MAX	400	MIN	0.00	AC-FT	48970	
WTR YR	2011	TOTAL	22928.60	MEAN	62.8	MAX	416	MIN	0.00	AC-FT	45480	

MAX DISCH: 497 CFS AT 19:00 ON MAY 07,2011 GH 3.70 FT SHIFT 0 FT

MAX GH: 3.70 FT AT 19:00 ON MAY 07,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SAIN T VRAIN SUPPLY CANAL NEAR LYONS, CO
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
LITTLE THOMPSON RIVER AT CANYON MOUTH NEAR BERTHOUD
Water Year 2011

Location.--	Lat. 40°15'29", Long. 105°12'21", SW ¼ NW ¼ sec. 2, T. 3 N., 70 W., Boulder County, on the left bank, at the mouth of the Canyon, 1800 ft. upstream from the Culver Ditch Diversion and 8.5 mi. southwest of Berthoud, Co.
Drainage Area and Period of Record.--	100 mi ² . 1962-1969, 1993 to present.
Equipment.--	Graphic water stage recorder and shaft encoder connected to a Sutron High Data Rate (HDR) Data Collection Platform (DCP) in a 42-inch metal shelter and well. An Electric Drop Tape is the primary reference gage.
Hydrologic Conditions.--	Drainage area consists of scrub oak and grass lands. Natural flows are augmented by seepage from the St. Vrain Supply Canal--Colorado-Big Thompson project. The SVSC Little Thompson turnouts are located about 0.25 miles upstream of the gage, but flow enters just below the gage. At higher flow the CBT deliveries appear to cause backwater at gage.
Gage-Height Record.--	The primary record is 15-minute satellite data with chart as back up. The record is complete for the period of gage operation. The period: November 11-30, 2010, the stage-discharge relationship was affected by ice. There is only partial day record on November 30, 2010 (gage shut off for winter) and March 10, 2011 (gage turned on). The station was closed for winter from December 1, 2010 through March 9, 2011.
Datum Corrections.--	Levels were not run this water year. It appears that levels have not been run since 1983.
Rating.--	The control is a degraded rock dam, however a beaver dam at the control caused variable backwater conditions at the gage this water year. Rating No. 13 was used the entire water year. Rating 13 is defined by measurements to 237 cfs. Thirteen measurements (Nos. 621-633) were made during the 2011 water year, ranging in discharge from 0.30 to 157 cfs. They cover the range experienced this year except the many lower flow days of October 2010 and September 2011. The peak flow of 186 cfs occurred at 0400 May 19, 2011 at a gage height of 4.85 ft with a shift of -0.18 ft. It exceeded measurement No. 626 made May 19, 2011 by 29 cfs and 0.28 feet of stage.
Discharge.--	Shifting control method was used all year. Shifts are caused by accumulation and washing out of material on the rock dam control, vegetation growing in the channel, and beaver dam activity. Measurements showed unadjusted shifts ranging from -0.58 to -0.01 feet. Shifts were distributed by time with consideration to stage and CBT deliveries. Gage height increases correlate with entry of water from CBT turnouts downstream, indicating that during these deliveries shifts might be even more negative than measured.
Special Computations.--	CBT deliveries cause backwater at the gage and must be dealt with as individual occurrences. Discharge is determined using preliminary shift distributions and distinct changes in gage height that directly correspond to delivery changes downstream. CBT releases were given special consideration when measurements were made during these releases. Corrections were made to measurement gage heights to discount the backwater effect during the deliveries. For the ice affected period November 11-30, flows were estimated using trends in flow prior to ice. Flow was estimated on November 30 and March 10 using partial day record. December 1, 2010 – March 9, 2011 gage closed for winter.
Remarks.--	The record is considered fair to poor, except for November 11 - 30, 2010 which is estimated and poor due to ice effect and November 30, 2010 and March 10, 2011 which are estimated and poor due to partial record. Almost all measurements made had a high maximum discharge per section percentage (often greater than 10%) due to rocky measurement sections. Six low flow measurements were made in low velocity flow below the lowest rated velocity of a pygmy meter. The fair to poor rating is due to the limits of measurement accuracy, and for lack of rating definition caused by the beaver activity. This gage is a partial year station that is closed in the winter months with no winter record kept or estimated. Station maintained by Mark Simpson and record developed by Lee Cunning.
Recommendations.--	An outside staff should be installed and used. A full set of levels should be run and a levels summary sheet brought up to date. The rock dam control should be repaired. Beaver dam activity needs to be removed and controlled. The vegetation surrounding the gage needs to be removed so that the control is visible from the gage. When backwater is noted, the downstream channel should be walked to see if the inflow area for CBT water is the source of the backwater. If so, photos should be taken for possible channel work by NCWCD.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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LITTLE THOMPSON RIVER AT CANYON MOUTH NEAR BERTHOUD

RATING TABLE-- LTCANYCO13 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

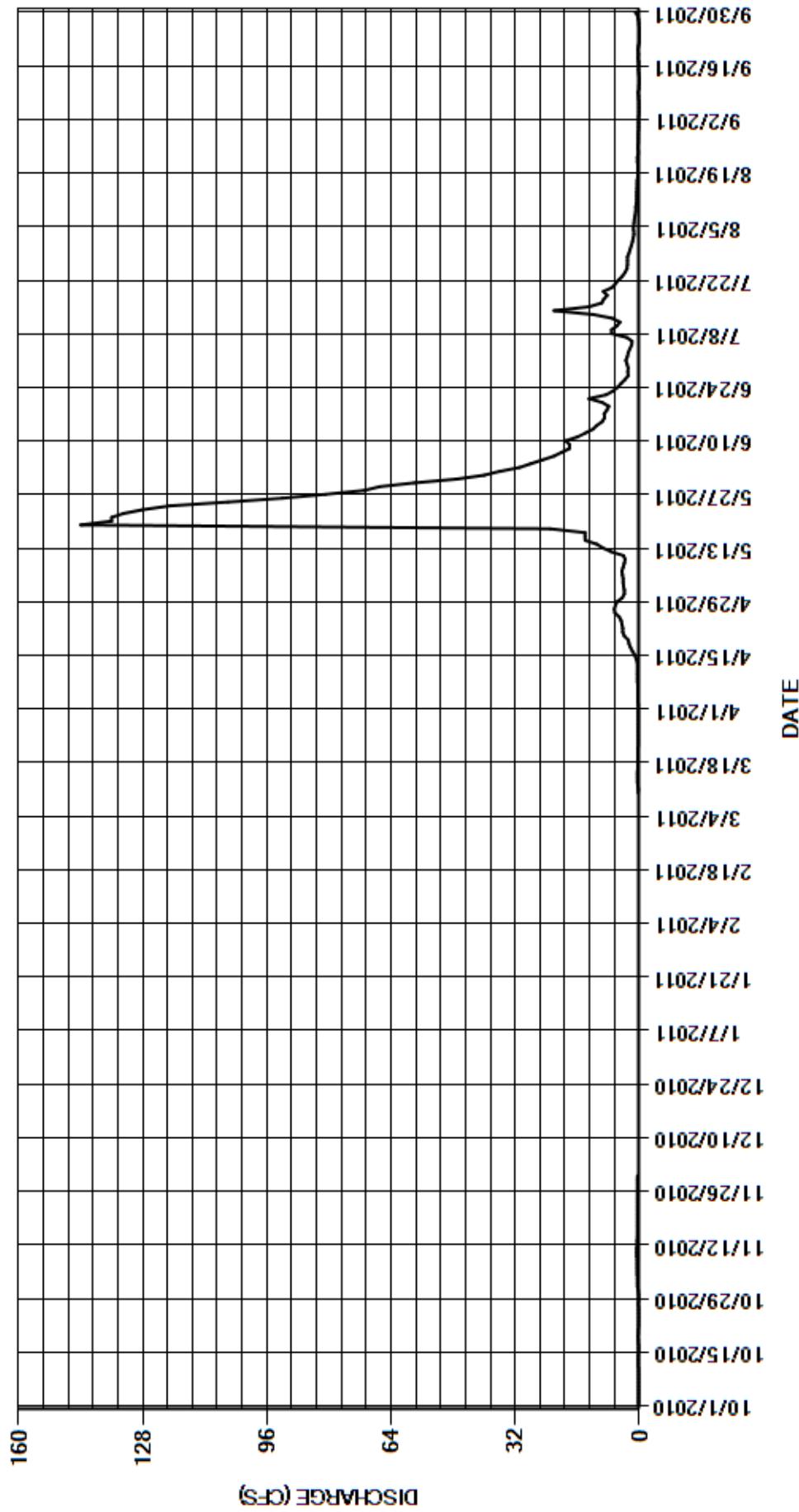
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.21	0.51	---	---	---	---	0.35	3.9	40	3.5	1.8	0.20
2	0.24	0.52	---	---	---	---	0.35	3.9	36	3.1	1.6	0.18
3	0.24	0.53	---	---	---	---	0.39	4.1	31	2.9	1.4	0.16
4	0.22	0.57	---	---	---	---	0.38	4.2	28	2.5	1.5	0.14
5	0.20	0.58	---	---	---	---	0.38	4.2	25	2.0	1.5	0.13
6	0.21	0.59	---	---	---	---	0.39	4.4	22	1.9	1.4	0.13
7	0.21	0.61	---	---	---	---	0.42	4.5	20	3.3	1.3	0.16
8	0.19	0.61	---	---	---	---	0.49	4.2	18	7.2	1.1	0.21
9	0.21	0.72	---	---	---	---	0.51	3.9	18	7.2	0.95	0.35
10	0.23	0.75	---	---	---	e0.36	0.54	3.7	19	5.8	0.95	0.06
11	0.26	e0.70	---	---	---	0.29	0.49	4.1	16	5.0	0.80	0.05
12	0.29	e0.65	---	---	---	0.45	0.46	7.3	14	7.0	0.70	0.04
13	0.29	e0.60	---	---	---	0.49	0.53	9.4	12	12	0.70	0.05
14	0.28	e0.55	---	---	---	0.49	0.84	11	11	22	0.70	0.13
15	0.25	e0.50	---	---	---	0.51	1.2	14	9.6	13	0.65	0.24
16	0.25	e0.50	---	---	---	0.48	1.8	14	9.0	9.7	0.58	0.17
17	0.27	e0.50	---	---	---	0.44	2.3	14	9.1	9.2	0.57	0.21
18	0.33	e0.50	---	---	---	0.45	2.7	23	8.4	8.3	0.43	0.39
19	0.39	e0.50	---	---	---	0.43	2.9	144	7.9	9.3	0.45	0.28
20	0.32	e0.50	---	---	---	0.39	3.9	136	9.6	7.1	0.47	0.43
21	0.28	e0.50	---	---	---	0.36	4.3	136	13	6.2	0.42	0.27
22	0.22	e0.50	---	---	---	0.36	4.3	133	8.6	5.4	0.52	0.03
23	0.19	e0.50	---	---	---	0.33	4.5	128	6.8	4.4	0.55	0.03
24	0.18	e0.50	---	---	---	0.35	4.7	121	5.6	3.7	0.33	0.03
25	0.21	e0.50	---	---	---	0.35	5.2	106	4.7	3.2	0.38	0.03
26	0.22	e0.50	---	---	---	0.36	6.3	92	3.7	3.1	0.40	0.05
27	0.26	e0.50	---	---	---	0.34	6.5	81	2.9	3.1	0.35	0.12
28	0.26	e0.50	---	---	---	0.35	6.2	71	3.0	3.1	0.33	0.24
29	0.25	e0.50	---	---	---	0.34	5.7	67	2.9	2.7	0.30	0.48
30	0.25	e0.50	---	---	---	0.34	4.4	58	3.2	2.4	0.26	1.1
31	0.31	---	---	---	---	0.34	---	47	---	2.1	0.23	---
TOTAL	7.72	16.49	---	---	---	8.60	73.42	1457.8	418.0	181.4	23.62	6.09
MEAN	0.25	0.55	---	---	---	0.39	2.45	47.0	13.9	5.85	0.76	0.20
AC-FT	15	33	---	---	---	17	146	2890	829	360	47	12
MAX	0.39	0.75	---	---	---	0.51	6.5	144	40	22	1.8	1.1
MIN	0.18	0.50	---	---	---	0.29	0.35	3.7	2.9	1.9	0.23	0.03
CAL YR	2010	TOTAL	8125.20	MEAN	29.9	MAX	253	MIN	0.18	AC-FT	16120	(PARTIAL YEAR RECORD)
WTR YR	2011	TOTAL	2193.14	MEAN	8.24	MAX	144	MIN	0.03	AC-FT	4350	(PARTIAL YEAR RECORD)

MAX DISCH: 186 CFS AT 04:00 ON MAY 19,2011 GH 4.85 FT SHIFT -0.18 FT

MAX GH: 4.85 FT AT 04:00 ON MAY 19,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LITTLE THOMPSON RIVER AT CANYON MOUTH NEAR BERTHOUD
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06744000 BIG THOMPSON RIVER AT MOUTH NEAR LA SALLE
Water Year 2011

Location.--	Lat. N40° 23'2.27", Long. W104° 47'1.15" (NAD83). Gage is located on the left bank of the Big Thompson River approximately 1.6 mi upstream from the mouth and 4 mi west of LaSalle, CO.
Drainage Area and Period of Record.--	830 sqmi (USGS Colorado StreamStats utility). Daily values are available from April 1, 1914 to October 31, 1915 and March 1, 1927 to present.
Equipment.--	Digital incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink2 Data Collection Platform (DCP) and a Stevens graphic water stage recorder in a wooden shelter overtop a galvanized stilling well at a smooth concrete control. The well is connected to the stream by two 2-in. intakes with flushing provisions. An electric tape index on the instrument shelf is the primary reference. A cantilever style chain gage was supplemental, but had been unreliable and was removed on October 17, 2011.
Hydrologic Conditions.--	Drainage area consists of high mountain terrain, municipal and agricultural areas. Gage is located downstream from many agricultural diversions which attempt to divert all available water. Flow is mostly seepage, return flows from agriculture, local runoff and municipal runoff and wastewater. The Colorado-Big Thompson (C-BT) project historically releases 'carry-over' water at the end of October every year to downstream users that have rights to that water. Control started washing out on the south end and was repaired October 17-19, 2011. Both north and south sides of the control were repaired and riprap was installed to prevent future erosion.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data and chart record as backup. The record is complete and reliable, except for the following days when the gage was ice affected and/or the well was frozen: December 31, 2010, January 1-6, 10-12, 2011, February 1-4, and 7-12, 2011. August 10-11 had missing DCP data, this data was filled in with good chart data with no loss of accuracy. Daily maximum and minimum stages for the satellite record agreed within +/- 0.02 feet of the chart. No instrument corrections were made this water year.
Datum Corrections.--	Levels were run September 2, 2011 using R.M.2 as base. The gage was found to be reading accurately and no adjustments were made.
Rating.--	The control is a 50-60 foot smooth concrete control on bedrock, about 2 feet high with rounded crest, located about 20 feet below the gage. At around 1000 cfs, the control submerges due to downstream channel conditions. Flood flows will go overbank on the right side. Rating 27 was used for the entire Water Year 2011 record and is defined by measurements from 1.14 to 6000 cfs. Rating 27 was created using Rating 25 up to 220 cfs (Measurement 567) and then measurements 568, 570 and 571. Historic high flow measurements (293, 373 and 959) which were used in creating Rating 25 were used for the high end of Rating 27. Sixteen measurements (Nos. 577-592) were made during the 2011 water year. They ranged in discharge from 1.04 to 107 cfs. No days were seen with flows below 1.04 cfs. Daily flows exceeding 150% of this years high measurement (No. 591) occurred on May 8-12, 19, and 20, 2011. The peak flow of 413 cfs occurred at 1645 May 11, 2011 at a gage height of 3.07 ft with a shift of 0.05 ft. It exceeded the high flow measurement made September 19, 2011 by 306 cfs and 1.42 ft. of stage.
Discharge.--	Shifting control method was used all year. Shifts are caused by material scouring and filling the pool behind the control. Shifts were applied as defined by measurements. Measurements showed shifts varying between -0.03 and +0.13 ft. The higher positive shifts (starting in April and going through mid October) are due to the south side of the control eroding. After control repair, the shift went from a +0.13 to -0.02. All shifts were given full weight except for Nos. 577, 578, 581, 584, 586 and 587 which were adjusted upto 5% to smooth the shift distribution.
Special Computations.--	Discharge for ice affected periods were estimated by interpolation between periods of good record and temperature trends.
Remarks.--	The record is good, except for periods of ice effect and no gage height record, which are estimated and poor. and higher daily flows exceeding 150% this year's high measurement which are fair. The peak is also rated fair. Station maintained and record developed by Lee Cunning.
Recommendations.--	Continue efforts to get higher flow discharge measurements and define the point at which the control goes into submergence.

STATE OF COLORADO
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06744000 BIG THOMPSON RIVER AT MOUTH NEAR LA SALLE

RATING TABLE.-- BIGLASCO27 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

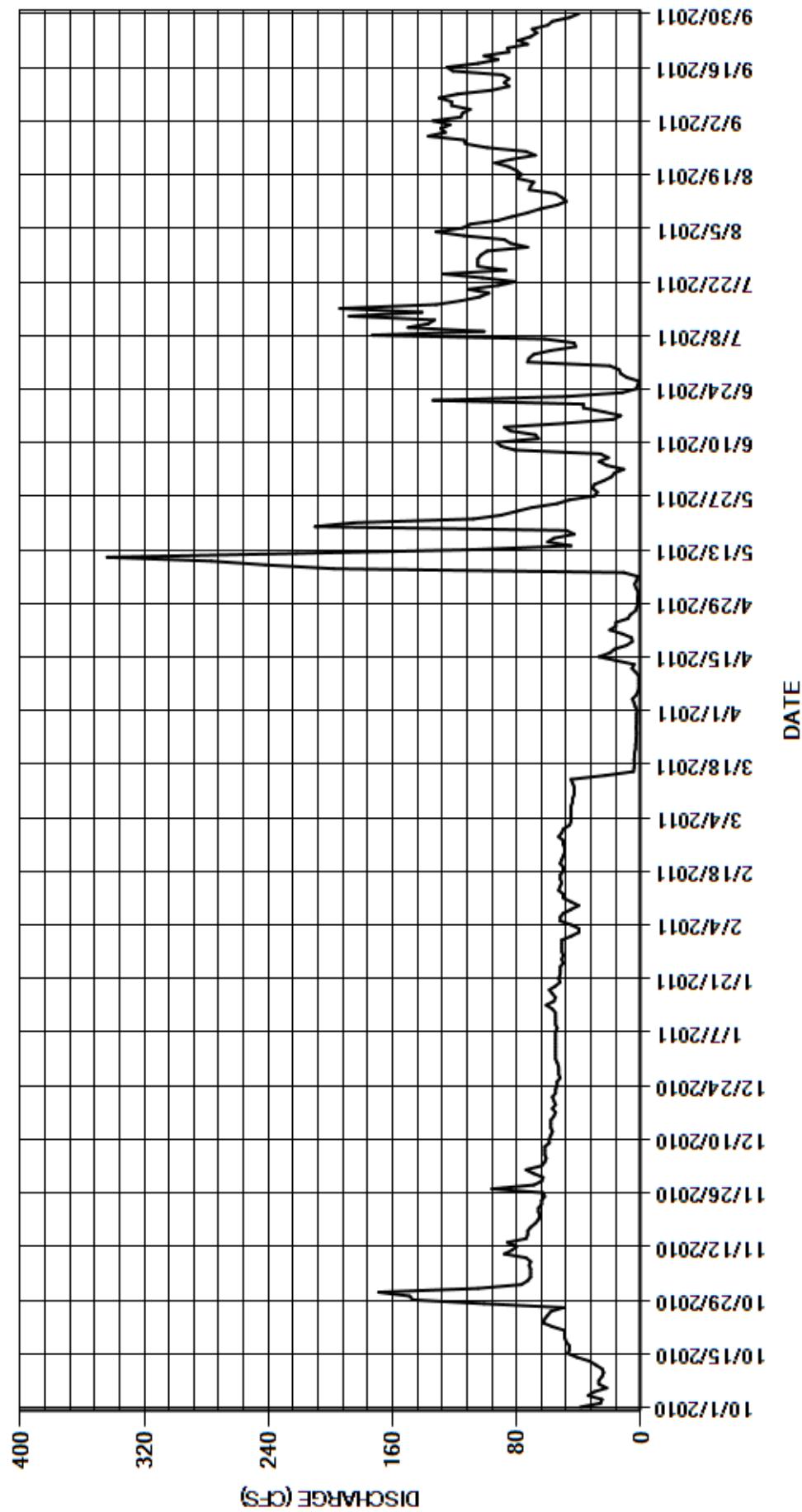
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	39	105	69	e55	e45	50	2.5	1.8	19	73	84	123
2	26	77	74	e55	e40	46	3.6	1.7	17	72	88	134
3	25	73	64	e55	e40	45	4.4	3.2	11	69	114	116
4	34	71	62	e55	e45	45	5.4	4.0	22	58	132	115
5	30	71	61	e55	52	45	3.0	2.6	27	42	115	110
6	22	71	62	e55	52	45	1.8	2.1	21	43	110	122
7	27	72	62	55	e50	45	1.3	11	26	62	92	122
8	27	71	62	54	e45	44	1.4	198	81	173	83	130
9	25	74	59	55	e40	44	1.4	242	90	101	73	118
10	24	88	59	e55	e45	43	1.3	277	93	150	65	96
11	25	83	58	e55	e50	43	3.4	344	66	137	54	85
12	29	80	57	e55	e50	43	5.7	222	68	133	48	88
13	33	86	58	57	53	44	4.2	107	84	188	51	85
14	41	74	58	61	52	45	16	45	88	141	55	89
15	47	73	58	56	51	23	27	60	49	194	72	121
16	46	73	56	55	52	4.8	20	56	18	132	71	125
17	46	71	55	57	52	4.3	17	43	13	116	69	105
18	48	68	57	59	50	4.2	9.1	48	24	104	80	92
19	49	66	55	55	50	4.3	5.5	210	37	98	77	101
20	49	65	56	52	52	4.2	6.0	185	37	111	80	85
21	49	66	57	53	51	4.0	12	108	134	92	85	86
22	57	66	55	52	50	3.4	20	90	48	81	94	73
23	63	64	55	52	49	3.4	16	80	12	102	83	79
24	62	64	54	52	49	3.0	16	70	2.9	127	68	71
25	60	62	54	50	50	3.0	8.3	54	1.9	87	74	67
26	58	63	52	51	50	2.9	6.7	46	1.2	105	99	70
27	50	96	53	50	53	3.0	3.5	30	9.1	105	113	60
28	101	69	53	51	51	3.0	2.5	28	13	105	114	57
29	147	64	53	51	---	2.8	1.9	31	14	103	137	46
30	149	63	54	51	---	2.9	2.2	30	20	99	126	40
31	169	---	e55	51	---	2.8	---	24	---	73	129	---
TOTAL	1657	2189	1797	1675	1369	706.0	229.1	2654.4	1147.1	3276	2735	2811
MEAN	53.5	73.0	58.0	54.0	48.9	22.8	7.64	85.6	38.2	106	88.2	93.7
AC-FT	3290	4340	3560	3320	2720	1400	454	5270	2280	6500	5420	5580
MAX	169	105	74	61	53	50	27	344	134	194	137	134
MIN	22	62	52	50	40	2.8	1.3	1.7	1.2	42	48	40
CAL YR	2010	TOTAL	41581.0	MEAN	114	MAX	1440	MIN	22	AC-FT	82480	
WTR YR	2011	TOTAL	22245.6	MEAN	60.9	MAX	344	MIN	1.2	AC-FT	44120	

MAX DISCH: 413 CFS AT 16:45 ON MAY 11,2011 GH 3.07 FT SHIFT 0.05 FT

MAX GH: 3.07 FT AT 16:45 ON MAY 11,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06744000 BIG THOMPSON RIVER AT MOUTH NEAR LA SALLE
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06752000 CACHE LA POUDRE AT CANYON MOUTH NEAR FORT COLLINS
Water Year 2011

Location.--	Lat. 40°39'52", Long. 105°13'26", in NW ¼ sec. 15, T.8 N., R.70 W., Larimer County, Hydrologic Unit 10190007, on left bank at mouth of canyon, 0.5 mi downstream from headgate of Poudre Valley Canal, 1.2 mi upstream from Lewistone Creek, and 9.3 mi northwest of courthouse in Fort Collins, CO.
Drainage Area and Period of Record.--	1,056 mi ² . Sporadic and somewhat unreliable data from June 1881 to Aug. 1883. Reliable data from Oct. 1883 to current year. Periodic water-quality data from 1962 to 1995.
Equipment.--	Graphic (weekly) water stage recorder and shaft encoder connected to a Sutron SatLink 2 DCP in a concrete shelter and stilling well. The primary reference gage is an Electric Tape Gage (ETG). There is a supplemental outside chain gage.
Hydrologic Conditions.--	Drainage area consisting of high mountain forested and mostly uninhabited terrain. Flow is partially controlled by releases from Seaman Reservoir. Several small transmountain diversions divert water from the Colorado and North Platte River Basins into the basin. High levels of snow this water year produced high-sustained flows for most of the season. Runoff in the Cache la Poudre basin was above normal this year.
Gage-Height Record.--	The primary record is 15-minute data taken from satellite monitoring with chart as back up. The record is complete and reliable, except for the following periods. The stage discharge relationship was affected by ice on November 21-23, 2010. November 24, 2010 the station was closed for the winter and reopened on February 23, 2011. The gage was visited, and chart and encoder calibration was checked, at least weekly; no corrections were indicated or made. Encoder mean gage heights checked with chart values to within +/-0.02 ft.
Datum Corrections.--	Levels were last run October 5, 2011 using RM 1 as base. The gage was found to read correctly and no corrections were necessary.
Rating.--	Control is a rock and gravel riffle about 100 feet downstream. This riffle was increased this year due to sustained flows in excess of 4,000 cfs. Fill and scour will still cause minor shifting. Rating CLAFTCCO15 was used for the entire water year beginning October 1, 2010. Seventeen measurements (Nos. 503-519) were made this year, ranging in discharge from 25.4 to 4,080 cfs. These cover the range in daily discharge experienced without exception. Measurements were made on or near the peak and low flow days. The peak flow of 4,180 cfs occurred at 0615 July 1, 2011 at a gage height of 6.72 feet with a shift of -0.13 ft. It exceeded the gage height of measurement No. 516, made on July 1, 2011 by 0.06 feet.
Discharge.--	Shifting control method was used all year. Shifts are caused by moss growth and by material moving in and out of the control section. Shifts were distributed by stage using variable shift table CLAFTCCOV01 from October 1, 2010 to 1230 August 11, 2011 using measurements 502-504 and 507-518. Shifts were then distributed by time proration to the end of the water year. Measurements were given full weight except Msmts 503, 504, 507, 509, 513, 515, and 518 which were discounted up to +/- 4% to smooth shift distributions. Shifts for measurements 505-506 made during the winter period were not used or applied.
Special Computations.--	Discharges for the ice affected and no gage height record periods from November 21, 2010 through February 23, 2011 were estimated and are based on partial good record, three measurements (505-507), air temperature data collected at the gage, and flows from a downstream gage-- USGS 06752260 CACHE LA POUDRE RIVER AT FORT COLLINS. No diversions were active in the reach between the two gages during this period.
Remarks.--	The record is good, except for the periods of ice affected and no gage height record, which are estimated and poor. Station maintained and record developed by Lee Cunning.
Recommendations.--	

STATE OF COLORADO
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06752000 CACHE LA POUDRE AT CANYON MOUTH NEAR FORT COLLINS

RATING TABLE-- CLAFTCCO15 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

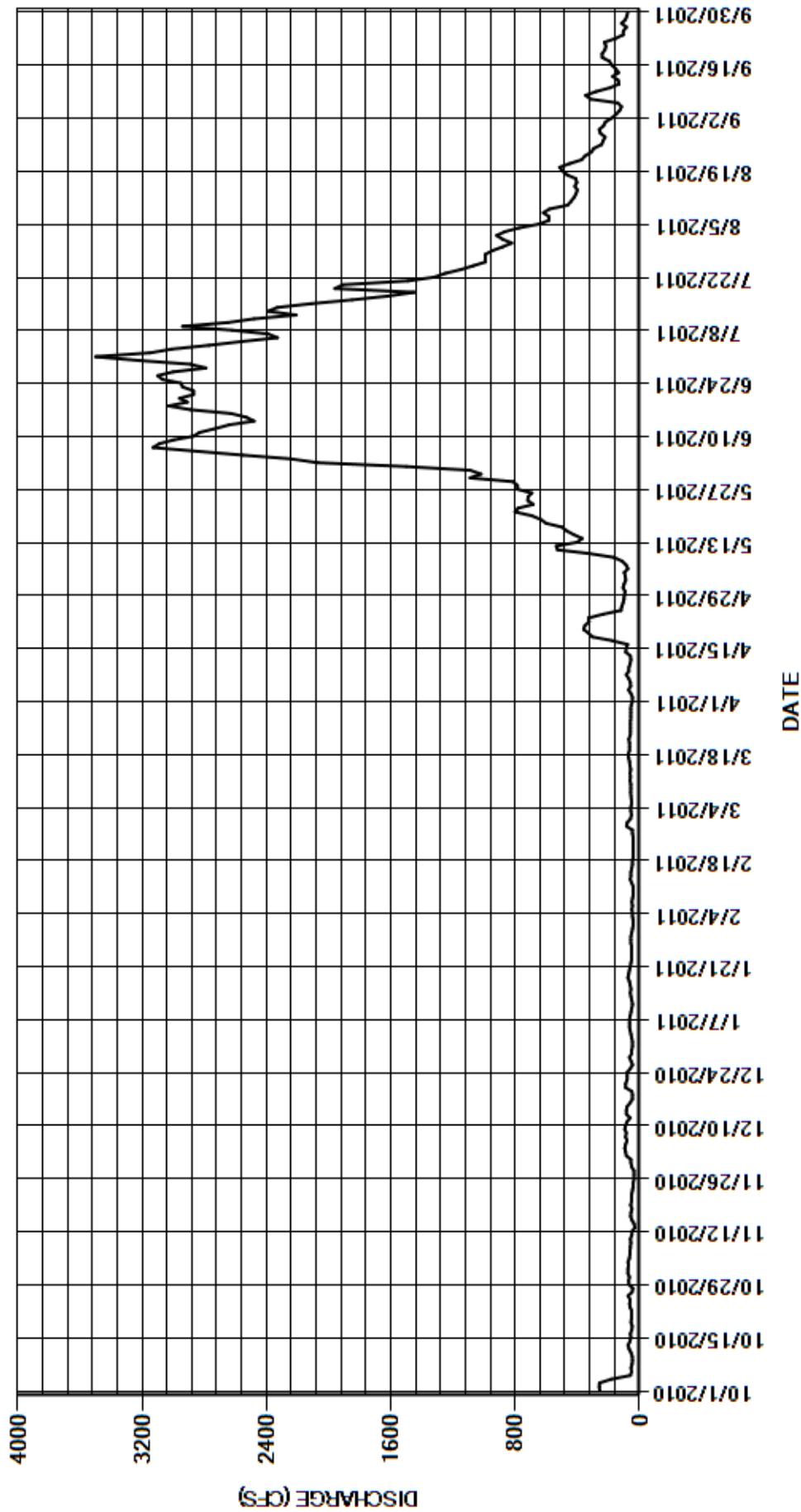
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	256	76	e55	e45	e40	58	45	106	1090	3500	880	219
2	259	75	e85	e50	e40	52	45	99	1500	3150	919	179
3	257	72	e90	e55	e45	56	55	89	2070	3010	867	151
4	182	74	e95	e60	e45	56	71	92	2240	2770	775	128
5	59	65	e90	e65	e50	51	57	98	2550	2560	647	116
6	51	62	e80	e65	e45	53	59	75	2840	2330	583	140
7	55	61	e90	e65	e50	55	69	87	3130	2390	584	315
8	48	59	e85	e60	e45	58	86	111	3090	2620	619	347
9	45	56	e95	e55	e40	56	68	165	3000	2940	579	280
10	47	59	e90	e50	e40	56	68	321	2870	2650	463	190
11	55	50	e80	e45	e40	61	60	527	2830	2480	441	132
12	67	49	e60	e50	e50	59	56	536	2730	2210	422	138
13	74	30	e85	e55	e60	61	59	401	2640	2390	409	173
14	62	35	e85	e60	e55	57	89	369	2480	2330	400	135
15	56	49	e80	e55	e55	62	86	423	2530	2110	416	153
16	59	57	e60	e60	e50	64	77	468	2630	1850	404	178
17	50	55	e45	e65	e45	70	173	500	2890	1620	410	194
18	47	49	e45	e75	e45	73	303	601	3030	1450	466	240
19	55	57	e50	e70	e40	65	329	635	2910	1960	495	241
20	52	51	e90	e65	e40	65	360	693	2960	1910	514	223
21	53	e50	e90	e60	e40	65	352	801	2870	1490	448	216
22	50	e50	e80	e55	e40	69	325	781	2870	1320	373	227
23	61	e45	e80	e50	e40	60	329	684	2940	1250	351	156
24	64	e40	e80	e50	41	58	234	719	2950	1150	311	104
25	60	e40	e60	e50	45	58	119	717	3070	1070	294	104
26	74	e35	e45	e50	45	58	115	693	3100	991	244	84
27	48	e35	e55	e55	84	58	106	786	3000	991	234	116
28	43	e35	e65	e55	79	57	100	786	2790	993	222	91
29	68	e50	e50	e55	---	56	98	814	2890	947	252	81
30	70	e55	e50	e50	---	57	93	1090	3220	881	259	76
31	65	---	e45	e45	---	54	---	1020	---	822	231	---
TOTAL	2492	1576	2235	1745	1334	1838	4086	15287	81710	60135	14512	5127
MEAN	80.4	52.5	72.1	56.3	47.6	59.3	136	493	2724	1940	468	171
AC-FT	4940	3130	4430	3460	2650	3650	8100	30320	162100	119300	28780	10170
MAX	259	76	95	75	84	73	360	1090	3220	3500	919	347
MIN	43	30	45	45	40	51	45	75	1090	822	222	76
CAL YR	2010	TOTAL	139197	MEAN	381	MAX	3940	MIN	13	AC-FT	276100	
WTR YR	2011	TOTAL	192077	MEAN	526	MAX	3500	MIN	30	AC-FT	381000	

MAX DISCH: 4180 CFS AT 06:15 ON JUL 01,2011 GH 6.72 FT SHIFT -0.13 FT

MAX GH: 6.72 FT AT 06:15 ON JUL 01,2011 (Hydrographer present for peak Gage Height.)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06752000 CACHE LA POUDRE AT CANYON MOUTH NEAR FORT COLLINS
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06752500 CACHE LA POUDRE NEAR GREELEY
Water Year 2011

Location.--	Lat. 40°25'04", Long. 104°39'22", in NW 1/4 sec. 11, T.5 N., R.65 W., Weld County, Hydrologic Unit 10190007, on right bank 15 ft. downstream from highway bridge, 2.9 miles east of courthouse in Greeley, and 3.0 miles upstream from mouth of the South Platte River.
Drainage Area and Period of Record.--	1890 sq mi. (USGS Colorado StreamStats utility). Sporadic values available from April 1, 1903 to 1905. Daily values are available from January 1, 1914 to December 31, 1920 and June 1, 1924 to present.
Equipment.--	Sutron shaft encoder connected to a Sutron SatLink2 Data Collection Platform (DCP) transmitting hourly and a Steven's Type A graphic water stage recorder in a 48-inch corrugated metal pipe shelter and stilling well. The well is connected to the channel with five 2-inch intakes equipped with flushing provisions. An electric tape gage placed on the instrument shelf of the shelter serves as the primary reference with a supplemental wire weight gage located on the downstream side of the Fern Ave. bridge. A high data rate Sutron 8210 DCP and Sutron 8500 shaft encoder were removed and the gage equipment upgraded to its current configuration on February 15, 2011 following an unexplained DCP failure.
Hydrologic Conditions.--	Gage is located downstream of the City of Greeley Wastewater Treatment Facility and can show small diurnals from the effluent. Storm runoff events from hardened surfaces in the City of Greeley result in rapid stage increases at the gage. Colorado Big Thompson project deliveries of several hundred cfs for a few days duration also pass the gage. The snowpack in the Cache La Poudre basin produced well above runoff this WY. Flows at the gage were much higher than normal and sustained. A rare "free river" condition on the Cache La Poudre River lasted into June.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data and chart record as backup. Instrument calibration was insured by 28 visits made to the gage by DWR personnel. No instrumentation corrections were required to the shaft encoder this year. Checks between the primary and backup records show agreement within ±0.02-ft. all year. The record is complete and reliable except for January 31, 2011 through February 15, 2011 when the well froze. Missing values occurring on February 15, 2011 when the DCP failed were filled in with chart record without loss of accuracy.
Datum Corrections.--	Levels were last run on October 4, 2011 using RM 4, established in WY2009, as base. Using this RM, the primary reference was found to be -0.033 ft low which was thought to be consistent with results seen in WY2010. However, after further investigation the procedure used to establish the elevation for RM 4 was in error. Levels need to be run in WY2012 to properly establish the elevation for RM 4 and verify any correction needed to the primary reference.
Rating.--	The low to mid level control is a gravel and sand channel with a downstream riffle with channel control at higher stages. At extreme stages the Fern Ave. bridge may become the regulating feature at which time flows can bypass the gage. Large gravel bars form behind the bridge to directly adjacent to the gage effectively divide the flow into two channels at times. These gravel bars were removed last year by Weld County. However, after the sustained high flows in Y2011, the gravel bars were reappeared nearly identical to before the cleaning activities. The channel adjacent to the gage is the main channel up to about 300 cfs. Above this point flows will start to flow across areas of heavy deposition and vegetative growth across the entire channel width. In August , 2010, Weld County cleaned upstream, downstream and under the bridge completely. The rating above a gage height of about 2.45 ft should be much different than original or stage-shifted rating 27. However, the higher flows seemed to follow pre-cleanout stage-shift relationships showing that the bridge may not be the control backing water upstream, causing minor flooding. Rating CLAGRECO27, dated January 4, 2010, in use since 2009 was continued in use for all of this year. It is defined by measurements from 50 to 4,500 cfs. Twenty-one discharge measurements (Nos. 1060-1080) were made this year, ranging in discharge from 16.9 to 2,390 cfs covering the range in stage experienced this year well. The peak flow of 2,650 cfs occurred at 1045 on June 11, 2011 at a gage-height of 8.46 ft. with a shift of -0.48 ft. It exceeded high flow Measurement No. 1074 made on June 9, 2011 by 260 cfs and 0.18 ft of stage.
Discharge.--	Shifting control method was used for all periods of open water. Shifts are caused by fill and scour of material into and out of the gage section and by in-channel and bank vegetal growth. Stage dependent shifting was mainly used this year. Variable shift table CLEGRECOVST10-2 was continued from the 2010 Water Year through December 8, 2010 adding measurements Nos. 1060-1064 as definition points. From December 8, 2010 to April 11, 2011 shifts were applied by time as defined by measurements. From April 11, 2011 to the peak of June 11, 2011 variable shift table CLAGRECOVST11-1 was used. It is defined by twelve measurements (Nos. 1068-1074) made during the period of use. From the peak to August 17, 2011 variable shift table CLEGRECOVST11-2 was applied. It is defined by six measurements (Nos. 1074-1079) made during the period of use. From August 17, 2011 through the end of the water year shifts were applied by time as defined by measurements. Open water measurement showed shifts ranging from -0.48 ft to +0.58 ft. All were given full weight except for Nos. 1060, 1064 and 1069 which were adjusted up to 2.25% to smooth shift distributions.
Special Computations.--	Discharge for frozen well period (January 31 – February 15, 2011) were interpolated from adjacent good record. Measurement No. 1066 was made on the tail end of this period.
Remarks.--	The record is good, except for periods of ice, which are estimated and poor. Station maintained and record developed by Lee Cunning.
Recommendations.--	Run levels in WY2012 to confirm establishment of RM 4 as well as any correction needed to the primary reference. As the channel stabilizes a new rating should be evaluated.

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06752500 CACHE LA POUDRE NEAR GREELEY

RATING TABLE-- CLAGRECO27 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

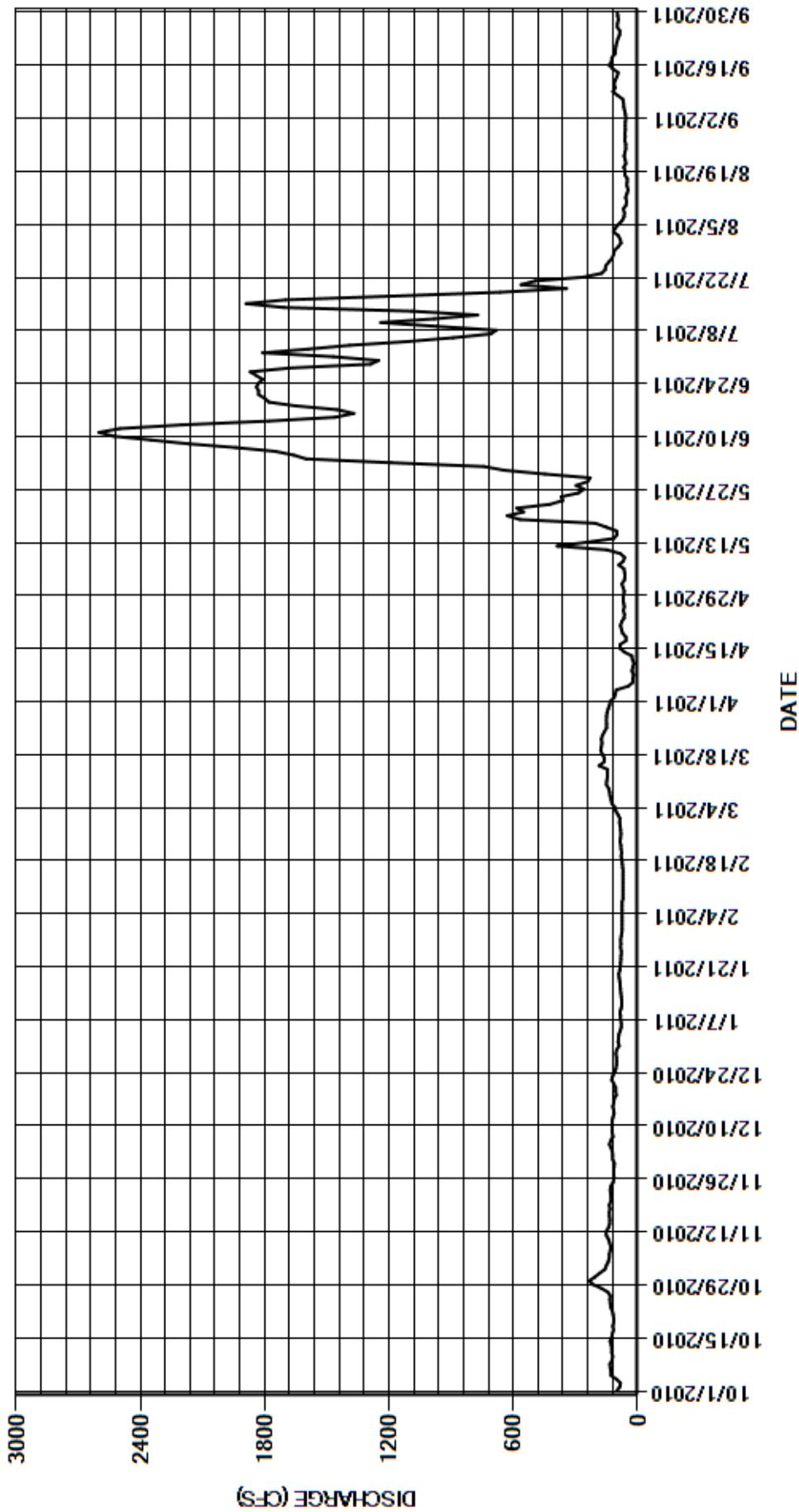
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	100	183	120	94	e75	85	132	70	643	1470	84	59
2	86	158	120	92	e75	94	113	76	742	1810	94	57
3	83	151	122	91	e75	105	107	64	1190	1590	117	59
4	102	142	127	84	e75	110	103	61	1600	1390	107	63
5	129	137	136	79	e75	124	45	63	1660	1110	91	67
6	129	137	130	79	e75	128	23	66	1750	890	74	68
7	132	132	119	83	e75	133	24	91	1940	709	65	72
8	134	130	122	83	e70	135	19	69	2170	683	64	97
9	124	135	124	85	e70	140	27	63	2350	968	69	119
10	120	141	122	79	e70	151	24	83	2530	1240	56	108
11	125	151	124	76	e70	149	17	149	2600	981	53	114
12	125	152	120	77	e70	146	25	388	2500	772	58	108
13	127	141	114	79	e70	146	28	245	2200	1090	52	99
14	133	135	115	81	e70	145	64	115	1780	1710	46	94
15	125	134	120	83	e70	186	85	99	1460	1890	51	120
16	122	136	115	84	72	162	84	102	1370	1700	51	137
17	116	137	114	86	74	160	56	152	1450	1180	50	125
18	120	133	103	89	74	171	57	204	1650	664	62	124
19	115	137	106	91	80	178	73	568	1780	343	60	109
20	115	129	106	86	77	175	78	630	1800	563	67	107
21	118	128	115	84	80	172	83	550	1830	494	57	105
22	122	131	125	82	81	175	77	583	1830	262	60	100
23	130	132	121	81	85	170	65	424	1840	174	65	95
24	132	129	111	80	82	160	64	361	1830	156	61	87
25	134	118	105	79	81	150	69	369	1810	154	57	86
26	132	114	102	82	82	150	64	286	1840	139	57	98
27	144	115	101	81	84	151	68	259	1870	123	62	97
28	175	116	102	82	87	150	70	297	1680	116	60	93
29	216	114	105	79	---	148	69	242	1290	113	61	96
30	233	112	101	76	---	142	64	229	1250	94	59	98
31	206	---	89	e75	---	135	---	447	---	80	60	---
TOTAL	4104	4040	3556	2562	2124	4526	1877	7405	52235	24658	2030	2861
MEAN	132	135	115	82.6	75.9	146	62.6	239	1741	795	65.5	95.4
AC-FT	8140	8010	7050	5080	4210	8980	3720	14690	103600	48910	4030	5670
MAX	233	183	136	94	87	186	132	630	2600	1890	117	137
MIN	83	112	89	75	70	85	17	61	643	80	46	57
CAL YR	2010	TOTAL	102893	MEAN	282	MAX	3020	MIN	45	AC-FT	204100	
WTR YR	2011	TOTAL	111978	MEAN	307	MAX	2600	MIN	17	AC-FT	222100	

MAX DISCH: 2650 CFS AT 10:45 ON JUN 11,2011 GH 8.46 FT SHIFT -0.48 FT

MAX GH: 8.46 FT AT 10:45 ON JUN 11,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06752500 CACHE LA POUDRE NEAR GREELEY
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
CACHE LA POUDRE RIVER AT GREELEY WASTEWATER PLANT
Water Year 2011

Location.--	Lat 40°25'21", Long 104°40'37" in SW ¼ section 4, T5N, R65W, Weld County. Just east of Greeley, on right bank, approximately 400 feet east of Highway 85, river mile 5.5.
Drainage Area and Period of Record.--	1,870 sq mi. (USGS StreamStats utility). 2007 to present.
Equipment.--	Digital incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink2 Data Collection Platform (DCP) transmitting hourly in a 7-ft. by 7-ft. precast concrete shelter overtop a 48-in diameter concrete stilling well. The City of Greeley's effluent flow meter (GREWASCO) is also connected to and transmitted by the DCP. The stilling well is connected to the channel by three 2-inch intakes equipped with flushing apparatuses. The primary reference is an electric tape gage located on the instrument shelf in the shelter. There are no provisions for a supplemental reference presently. A bank operated cable way is located near to the shelter. Gage is owned and maintained by the City of Greeley in cooperation with the Colorado Division of Water Resources.
Hydrologic Conditions.--	Drainage area of varying topography. Stream is heavily regulated upstream by numerous diversions from and deliveries to the stream. Due to its proximity to the City of Greeley, the gage is subject to rapid changes in stage from hardened surfaces within the City of Greeley. The snow pack in the Cache la Poudre basin produced a runoff discharge this year that was approximately 2 times greater than that produced last year. This gage cross-section is typically subject to heavy Sago pond weed growth during late spring and summer. Because of high runoff through June 2011, there was little to no pond weed this water year. While there was a slight re-occurrence of the pond weed in the later part of the water year, it was easily removed and adverse effects of the pond weed minimized.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data as backup. Instrument calibration was maintained by twenty-six visits made to the gage. One instrument calibration correction of -0.02 ft. was made on April 7, 2011 and applied to the record as defined by visits. The record is complete and reliable except for: December 7-18, 2010 when a coffer dam was erected downstream of the gage for construction of a new diversion. The coffer dam caused backwatering of the gage of varying magnitude; January 31, 2011 when the stilling well appears to have frozen; and April 6-7, 2011 when the DCP stopped transmitting.
Datum Corrections.--	Levels have not been run since the gage was repurposed and put into use in the 2007 Water Year.
Rating.--	The control for low to moderate flow is a 60-ft. by 7-ft. hinged-crest gage with concrete abutments approximately 50-ft. downstream from the shelter. The high flow control is the channel. Large shifts seen at this gage are typically caused by thick vegetal growth along the left side of the channel. Fill and scour of gravel, sand and mud also cause shifts. During low flows a sand bar will form just downstream of the control section. Rating CLAWASCO07, developed in WY2010 was continued in use for all of this year. Seventeen discharge measurements (Nos. 73-89) were made during the year, ranging in discharge from 49.1 to 2,550 cfs covering the range in stage experienced this year well. The peak flow of 2,710 cfs occurred on June 10, 2011 at 1630 at a gage-height of 6.84 ft. with a shift of +0.01 ft. It exceeded high flow Measurement No. 85 made June 9, 2011 by 160 cfs and 0.19 ft. of stage.
Discharge.--	Shifting control method was used for all periods of open free-flow record. Shifts were distributed by time as defined by measurements from October 1, 2010 to April 20, 2011 and again from August 26, 2011 through the end of the water year. From April 20, 2011 through August 26, 2011 stage dependent shifting using variable shift tables CLAWASCOVST11-1 and CLAWASCOVST11-2 was applied. CLASWASCOVST11-1 defined by five measurements (Nos. 81-85) made during the period of use was applied from April 20, 2011 through the peak of June 10, 2011 (1630). CLAWASCOVST11-2, defined by five measurements (Nos. 85-89) was applied from the peak to August 26, 2011. Open water measurements showed shifts varying between -0.21 and +0.31 ft. All were given full weight except for Nos. 82, 83, 86 and 87 which were adjusted up to 1.7% to smooth shift distributions.
Special Computations.--	Discharge for the backwater period was estimated from adjacent good record with consideration given to changes in stage. Discharge for the period when the stilling well was frozen was estimated from adjacent good record.
Remarks.--	The record is good except for the frozen stilling well period and the period of backwater which are estimated and poor and September 8, 2011 through the end of the Water Year which is fair due to a degree of ambiguity in the shifting application due to lack of measurements and visits made to the gage. Station maintained by the City of Greeley Water Pollution Control Facility in cooperation with Colorado Division of Water Resources staff. Record developed and reviewed by Division One staff.
Recommendations.--	Establishment of reference marks and running of levels should be done. Additional measurements should be made as warranted by flow conditions. Additionally, measurements at the beginning and end of the water years should be taken close to their respective date to better distribute shifts.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

CACHE LA POUDRE RIVER AT GREELEY WASTEWATER PLANT

RATING TABLE.-- CLAWASCO07 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

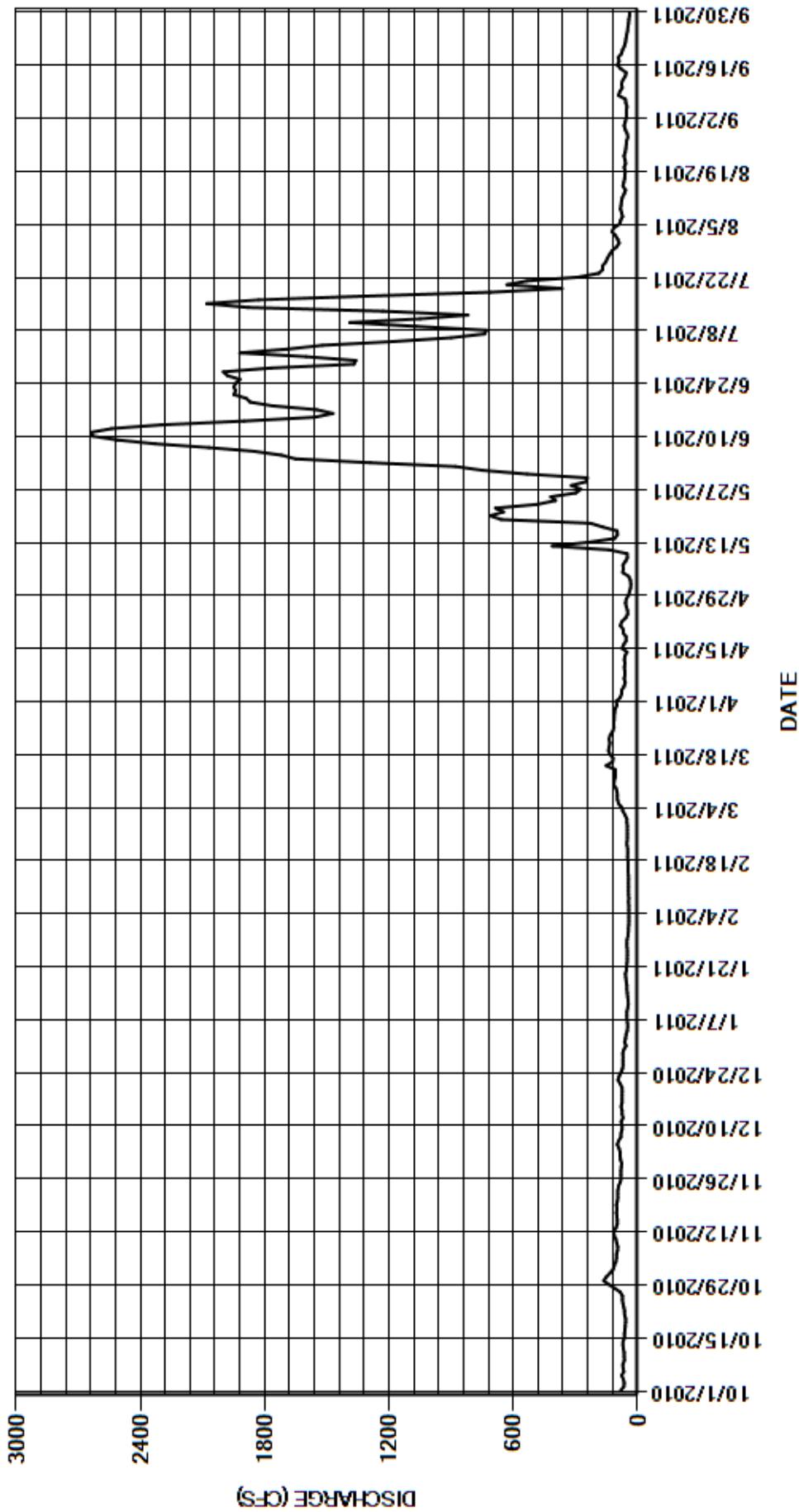
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	82	134	83	63	43	52	103	34	751	1600	96	60
2	67	118	84	58	42	61	84	33	879	1920	107	55
3	65	113	85	56	42	71	77	35	1290	1690	124	53
4	69	105	90	50	43	77	76	43	1650	1520	115	55
5	77	102	98	48	43	92	65	72	1720	1180	87	51
6	67	102	91	49	43	97	e60	69	1850	900	82	57
7	70	97	e80	51	44	98	e65	71	2070	739	73	59
8	71	96	e80	52	43	99	61	58	2330	730	77	93
9	64	101	e75	52	44	104	62	49	2510	1070	83	86
10	65	105	e75	48	45	115	64	51	2630	1390	80	74
11	65	114	e80	45	44	113	61	138	2640	1050	78	78
12	69	115	e70	46	45	108	64	412	2540	819	74	72
13	71	104	e75	48	44	108	61	237	2300	1230	65	60
14	70	98	e75	50	45	108	51	111	1900	1880	58	55
15	63	98	e80	52	46	152	75	97	1560	2080	71	81
16	64	100	e75	52	46	121	67	99	1470	1830	67	98
17	61	102	e75	55	46	118	55	167	1550	1310	63	89
18	60	99	e75	57	47	134	55	226	1760	711	61	94
19	58	102	74	59	49	141	69	659	1870	365	60	78
20	58	98	75	54	47	137	70	713	1890	631	65	73
21	63	95	84	53	48	134	83	647	1950	534	58	64
22	63	95	95	51	51	138	77	686	1940	287	61	59
23	67	95	89	50	51	133	58	484	1950	188	66	56
24	71	92	80	49	49	121	48	396	1940	168	60	53
25	74	84	73	49	49	114	49	419	1920	169	57	49
26	73	80	70	51	49	116	55	299	1980	154	55	47
27	84	81	70	51	49	114	58	274	2000	146	53	44
28	110	81	70	51	52	113	55	320	1770	135	47	43
29	139	79	72	47	---	112	44	248	1370	123	51	39
30	164	77	67	45	---	108	39	243	1360	101	60	39
31	151	---	56	e45	---	100	---	534	---	89	65	---
TOTAL	2395	2962	2421	1587	1289	3409	1911	7924	55340	26739	2219	1914
MEAN	77.3	98.7	78.1	51.2	46.0	110	63.7	256	1845	863	71.6	63.8
AC-FT	4750	5880	4800	3150	2560	6760	3790	15720	109800	53040	4400	3800
MAX	164	134	98	63	52	152	103	713	2640	2080	124	98
MIN	58	77	56	45	42	52	39	33	751	89	47	39
CAL YR	2010	TOTAL	102869	MEAN	282	MAX	3380	MIN	48	AC-FT	204000	
WTR YR	2011	TOTAL	110110	MEAN	302	MAX	2640	MIN	33	AC-FT	218400	

MAX DISCH: 2710 CFS AT 16:30 ON JUN 10,2011 GH 6.84 FT SHIFT 0.01 FT

MAX GH: 6.84 FT AT 16:30 ON JUN 10,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CACHE LAPOUDRE RIVER AT GREELEY WASTEWATER PLANT
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06754000 SOUTH PLATTE RIVER NEAR KERSEY
Water Year 2011

- Location.-- Lat. $40^{\circ}24'45''$, Long. $104^{\circ}33'47''$, in NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 9, T.5 N., R.64 W., Weld County, Hydrologic Unit 10190003, on downstream side of bridge on State Highway 37, 1.9 mi north of railroad in Kersey, and 2.5 mi downstream from Cache la Poudre River.
- Drainage Area and Period of Record.-- 9,659 mi². May 1901 to Dec. 1903, Mar. 1905 to current year. Monthly totals only for some periods. Periodic water-quality data available from 1950.
- Equipment.-- Sutron AccuBubble and CFB stage sensors connected to a Sutron SatLink2 Data Collection Platform (DCP) in a concrete block shelter on the downstream left edge of water side of the State Highway 37 bridge near Kersey, CO. The primary reference is a wire weight gage located midspan between the first and second bridge pier as referenced from the left bank. A supplemental (0-6.66 ft.) staff gage is installed on the bridge pier closest to the shelter.
- Hydrologic Conditions.-- The Kersey gage reflects general trends of drought or abundance throughout the South Platte basin. It is the first gage below the confluences of all mountain snowmelt tributaries of the South Platte. In a low to average year this native water supply is largely captured for agricultural and municipal uses before it reaches Kersey. In this full use scenario, the Kersey gage records return flows and water passed downstream for senior users. In a year with above average snowmelt, the Kersey gage will see high water during runoff. The 25-year average for 1976-2000 was a yearly total of 914,000 acre-feet. This year saw a total of 753,000 acre-ft. The Kersey peak flow and a significant portion of the total flow in dry years often comes from front range rainstorms. These storms are often seen as sharply rising hydrographs that peak in the evening. In drought times, this storm runoff is most welcome to the irrigators along the South Platte in Eastern Colorado.
- Gage-Height Record.-- The primary record is 15-minute satellite telemetry data from the AccuBubble with the DCP data log and CFB data as backup. The record is complete and reliable, except for the following. The AccuBubble data had occasional spikes, presumably due to sand on the muffler. Calibration was maintained by over 154 wire weight readings made during measurements and visits to the gage. With a few exceptions, calibration was good. Corrections applied to the record ranged from -0.06 to +0.05 ft and were distributed within the record. On some visits, the AccuBubble self-corrected a hundredth or two when continuous live-readings were taken for 5-10 minutes. These adjustments were not considered as record corrections. The channel was ice-free during the winter except for February 2-7, 10-11 which were backwatered due to downstream ice dams. A few missing unit values on Jan 8 and Sept 7 were filled in using the DCP data log without loss of accuracy.
- Common issues with data at this gage: Differences between the instrument and the wire weight are not corrected until they have been observed to be consistent for several visits. When corrections are made every visit, then it is not uncommon to see compensating plus and minus corrections on successive visits. If this occurs, then record datum corrections must be distributed by assuming that some adjustments were made in error. The Acububbler is subject to spiking or "painting" due to sand. Before recording an instrument reading when sand problems are suspected, it is wise to force a purge or do a more sustained air injection by keeping the instrument on "live reading". Rarely, the muffler is uncovered and visible from above on the bridge. It is useful to note this condition in visit remarks, as this eliminates sand as a consideration. Readings for storm peaks at this gage are problematic since high water manifests as unsteady flow. The pier staff can be observed to rise and fall several tenths of a foot in a few minutes. Presumably this is due to the variable resistance of vegetation in the high water channel. In the record data, it is not possible to distinguish whether a data spike is due to sand/painting or a legitimate reading of unsteady flow. For high water, the GH plot can be used to provide useful average GH's. During cable measurements, wire weight readings should be made every 15 minutes.
- Datum Corrections.-- Levels were not run in WY2011 and were last run in WY2005. Levels were run October 4, 2011 using BM 1 (RM6) as base. The elevation of the wire weight gage (WWG) check bar (RP) was found to be reading within +/-0.02 ft of the established elevation. However, the bottom of the wire weight was found to be 0.087 feet low, and the WWG reading of the check bar was found to be 0.13 ft low. Levels should be repeated in April 2012 to check and verify results. No datum, gage height or shift adjustments due to levels were made in the WY2011 record. A new Reference Mark (RM2), a pin located on the top of the Northeast Bridge Pier just southwest of the station house, elevation 14.593 ft, was established.
- Rating.-- Low water control is a channel constriction and sand channel bed about 150 ft downstream from the gage, where pilings exist on the left bank for an old bridge. During very low flow the channel bed is stable. Channel bed changes occur by time for sustained low and medium flows. A large peak will change the channel and result in a new pattern of shifts for lower flows. Brush and trees in the overflow areas cause backwater at high stages. The channel at the gage appears to be widening over time. Review of the measurement history indicates that the GH for 10,000 cfs has been gaining a foot every 10-15 years. Rating No. 24 was used again this year, and is defined by measurements from 281 to 11,000 cfs. Historic measurements run higher and lower and were used for trends. Twenty-five measurements (Nos. 1053-1077) were made this year ranging in discharge from 242 to 8,700 cfs. They cover the range in daily discharge experienced except for the lower daily flows on April 8-14, 23-25; May 2-8, 2011; and higher daily flows on July 14-15, 2011. The peak discharge of 9,520 cfs occurred at 2130 on July 15, 2011 at a gage height of 9.58 ft with a shift of -0.10 ft. It exceeded measurement 1072 made on July 14, 2011 by 0.33 ft. in stage.
- Discharge.-- Shifting control method was used. Shifts are caused by sand movement, vegetation, and the variable effects of the bridge piers with stage. Measurements showed unadjusted shifts ranged from -0.23 ft to +0.11 ft. Shifts were distributed by time from October 1 2010 to 1400 April 29 2011 and from 2145 July 15 2011 to the end of the water year. Shifts were distributed by stage for the period 1415 April 29 2011 to the peak at 2130 Jul 15 2011 using variable stage shift relationship, PLAKERCO11VS1A, which is based on Msmts 1064-1072 made during the period. Msmts 1053, 1055, 1057, 1059, 1061, 1065-1071 were discounted from -4% to +4% to smooth shift distribution.

Special Computations.--	A hydrograph was plotted. Discharge was estimated on ice affected days using air temperature data and gage height trends in good record before and after ice affected periods.
	High flow msmts 1067 to 1071 were made at the WCR58 bridge crossing of the South Platte, approximately 3.75 miles upstream of the gage. Flows entering the South Platte between this measurement location and the Kersey gage were added to the total flow measured considering the lag time for travel distance. The mean gage height for the measurement was determined by inspection of the PLAKERCO stage record against assumed travel times based on measurement velocities at the WCR58 bridge vs. those made at the PLAKERCO bridge, inspection of the stage record and assumed travel time from the CLAGRECO gage and spot observations made at Wildcat Creek. This method is somewhat dubious. Its practice is being evaluated as a surrogate due to poor and dangerous measurement conditions at the Kersey Bridge. Msmt 1072 was made at the Kersey Bridge the same day as Msmt 1071 which was made using this alternate method. Msmt 1072 tends to corroborate the results of Msmt 1071.
Remarks.--	The record is rated as good, except for periods of ice effect which are estimated and poor, and the high flow period from May 12-Jul 23, which is rated fair due to high flow measurement methods employed during this period. Station operated and maintained by Bob Cooper and Lee Cunning and record developed by Lee Cunning.

Recommendations.-- The AccuBubble and CFB data should be closely compared to evaluate which would be better for the record. Field notes should clearly identify which instrument is being used for measurements. Levels must be run in the spring of Water Year 2012 to resolve issues with levels run on October 4, 2011. The established elevation of R.M. 7 may need to be reconsidered.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06754000 SOUTH PLATTE RIVER NEAR KERSEY

RATING TABLE-- PLAKERCO24 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

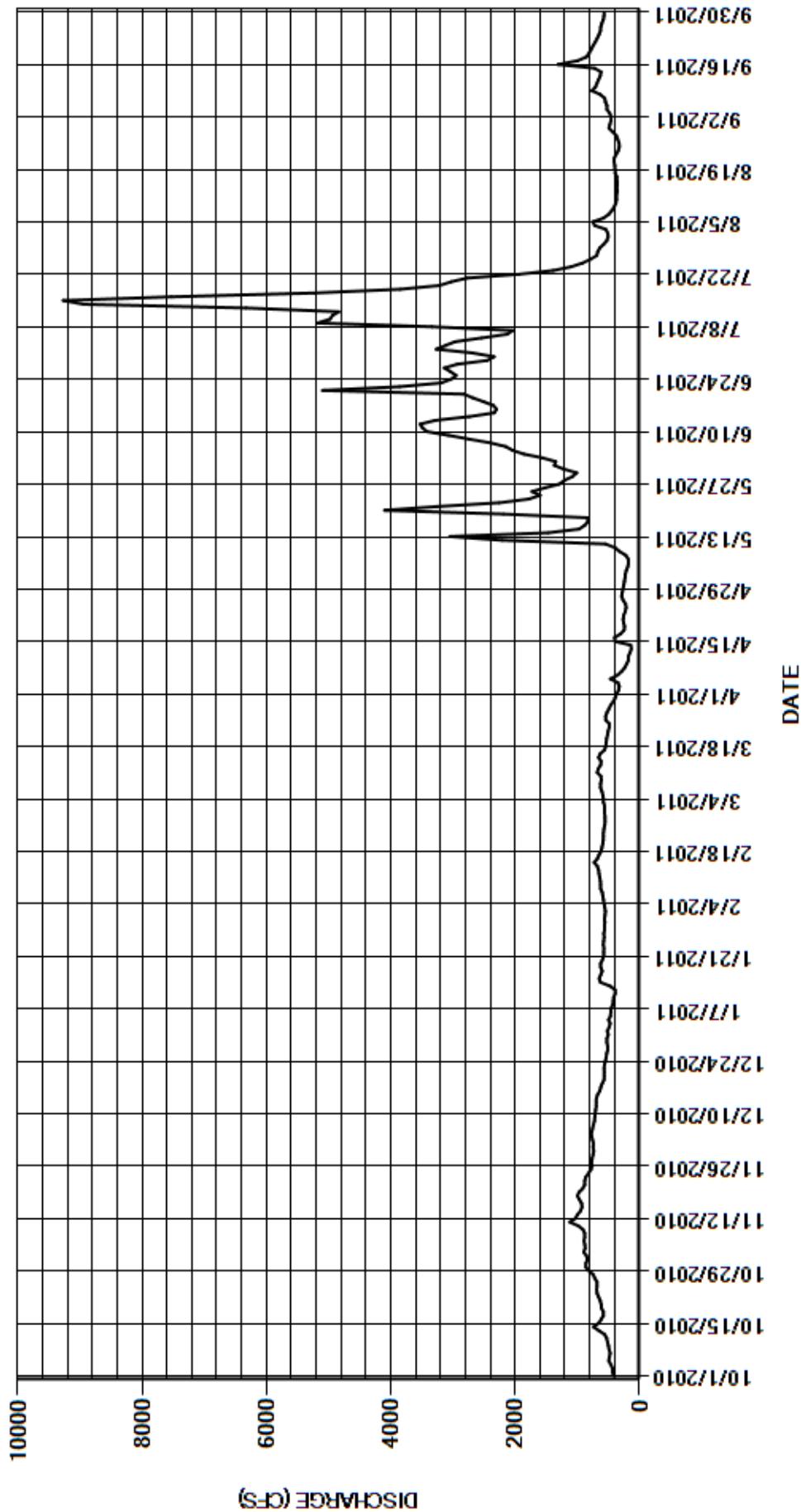
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	422	839	748	519	555	563	368	244	1370	2690	506	458
2	434	854	740	490	e550	560	337	235	1350	3270	511	457
3	436	899	758	472	e560	579	326	228	1560	3120	545	480
4	464	874	772	499	e570	583	347	212	1860	2970	720	526
5	497	881	771	467	e580	591	468	188	2040	2540	751	523
6	484	893	756	462	e590	606	353	178	2150	2130	581	549
7	472	880	741	461	e600	629	288	183	2400	2040	497	560
8	490	882	725	431	626	627	238	222	2740	3340	446	633
9	501	910	720	423	628	616	208	322	3070	5180	408	767
10	516	986	713	416	e630	620	178	393	3420	4980	381	708
11	529	1120	705	391	e640	680	180	545	3490	4940	369	684
12	561	1030	696	394	652	664	154	2210	3530	4840	373	658
13	652	998	695	475	659	626	132	3050	3290	6330	359	631
14	739	948	695	629	679	618	142	1470	2740	8940	363	620
15	659	926	676	650	729	658	391	971	2340	9270	361	723
16	619	933	639	624	678	633	403	882	2300	7530	362	1310
17	582	967	624	601	653	565	306	829	2350	5220	364	998
18	580	1000	600	624	618	544	249	833	2510	3850	393	857
19	612	973	571	627	605	537	241	2190	2680	3220	394	812
20	618	913	566	598	592	530	258	4100	2820	3030	398	780
21	632	879	566	577	584	516	263	3260	5100	2770	410	749
22	658	882	571	577	579	506	254	2260	3860	1940	406	712
23	683	866	564	572	580	489	230	1780	3190	1390	378	681
24	689	823	549	582	573	486	217	1600	3030	1100	343	652
25	684	782	537	577	560	545	225	1730	2950	917	325	628
26	683	762	529	570	553	547	265	1520	3040	790	330	625
27	720	774	510	575	555	525	288	1290	3140	688	351	606
28	747	763	514	562	561	493	279	1210	2930	673	373	582
29	813	748	526	564	---	465	267	1080	2450	641	430	573
30	865	737	526	558	---	419	255	1010	2340	578	492	566
31	862	---	502	563	---	390	---	1220	---	526	478	---
TOTAL	18903	26722	19805	16530	16939	17410	8110	37445	82040	101443	13398	20108
MEAN	610	891	639	533	605	562	270	1208	2735	3272	432	670
AC-FT	37490	53000	39280	32790	33600	34530	16090	74270	162700	201200	26570	39880
MAX	865	1120	772	650	729	680	468	4100	5100	9270	751	1310
MIN	422	737	502	391	550	390	132	178	1350	526	325	457
CAL YR	2010	TOTAL	457521	MEAN	1253	MAX	11600	MIN	276	AC-FT	907500	
WTR YR	2011	TOTAL	378853	MEAN	1038	MAX	9270	MIN	132	AC-FT	751500	

MAX DISCH: 9520 CFS AT 21:30 ON JUL 15,2011 GH 9.58 FT SHIFT -0.1 FT

MAX GH: 9.58 FT AT 21:30 ON JUL 15,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06754000 SOUTH PLATTE RIVER NEAR KERSEY
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06758500 SOUTH PLATTE RIVER NEAR WELDONA
Water Year 2011

Location.--	Lat N 40° 19'17.1", Long. W. 103° 55'13.46" (NAD83) in Morgan County, CO Hydrologic Unit 10190003. Gage is located on the left bank 660 ft. downstream from the Hwy. 144 bridge, 3.1 miles southeast of Weldona, CO.
Drainage Area and Period of Record.--	13,200 mi ² (USGS Colorado StreamStats Utility). Daily values are available from October 1, 1952 to present.
Equipment.--	Digital incremental Sutron 56-0540-400-DTR shaft encoder and a Sutron CFB bubbler connected to a Sutron SatLink2 Data Collection Platform (DCP) and a continuous graphic water-stage recorder housed in a corrugated metal pipe shelter and stilling well. The primary reference is an electric tape gage inside the shelter with a supplemental staff gage located on the left bank near the gage which was installed on September 9, 2010. The datum of the staff was not verified by levels but was established with respect to the electric tape gage reading. The CFB is primarily used when the inlets become or are near isolation at lower flows. Datum of gage is 4309.79 ft. MSL based on a 2005 survey conducted by the Colorado Water Conservation Board.
Hydrologic Conditions.--	Drainage area is heavily regulated upstream by numerous reservoirs, diversions from and deliveries to the stream.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data and chart record as backup. Shaft encoder data were used from Oct 1 to 1630 Oct 18, 2010 and from 1315 May 13, 2011 to 1045 Sep 20, 2011. CFB data were used during periods of low flows when the inlets were or near isolation, from 1645 Oct 18, 2010 to 1300 May 13, 2011 and from 1100 Sept 20 through the end of the water year. The record is complete and reliable except for: Feb 19-Mar 11, 2011 when the CFB was out of calibration; Mar 19, 21-25, 2011 when the CFB unit was experiencing significant "chatter". Missing values occurring on April 3 and 4, 2011 were estimated from adjacent good record with respect to upstream gage conditions. Missing data on June 17, 2011 was taken from the chart record without loss of accuracy. Instrument calibration was supported by 39 visits made to the gage.
Datum Corrections.--	Levels were last run on September 13, 2005 using R.M. 5 as base. No correction was made.
Rating.--	Section control is a shale outcrop about 100 ft. below the gage. It has proved to be a very effective control for low and medium flows. High flows have occasionally brought enough sand down the channel to cover up the shale, at which point the control is a channel constriction with a moving sand bed. High flows also spread out into relatively flat areas where vegetation has taken over in recent years. Rating No. 19 was continued in use for 2011. It was created in 2006 and is defined by measurements from 78 to 16300 cfs. Below 650 cfs, Rating 19 was created with 2006 measurements. The high water end was taken from an equation fit through historic points. Twenty-two discharge measurements (Nos. 329 - 350) were made this year ranging in discharge from 104 cfs to 6520 cfs covering the range of stage experienced during this year well, except for the lower daily flows on March 2 -7, 9-17, April 5-11 and May 8-10, 2011 and the higher daily flows of July 15-17, 2011. The peak flow of 8920 cfs occurred at 0945 on July 17, 2011 at a gage height of 8.58 ft with a shift of -0.58 ft. It exceeded Measurement No. 345 made on July 15 by 0.87 ft. in stage.
Discharge.--	Shifting control method was used all year. Measurements showed unadjusted shifts ranging from -0.58 ft. to +0.58 ft. Shifts were applied by time with consideration given to change in stage from October 1-13, 2010, November 18–December 17, 2010, March 11–May 6, 2011, and September 28–30, 2011. Stage dependent shifting was applied from: October 13–November 28, 2011 using variable shift table PLAWELOCOVST1101 defined by Measurement Nos. 329-332 made during the period of use; December 17, 2010 – March 11, 2011 using variable shift table PLAWELOCOVST1102 defined by Measurements Nos. 333-337 made during the period of use; May 6–June 2, 2011 using variable shift table PLAWELOCOVST1103 defined by Measurement Nos. 339-341 made during the period of use; and, June 2 – September 28, 2011 using variable shift table PLAWELOCOVST04 defined by Measurement Nos. 341-350 made during the period of use. Measurements Nos. 334, 335, 343, 344, 346 – 349 were discounted up to 5% to smooth shift distributions.
Special Computations.--	The period of February 19, 2011 - March 11, 2011 was computed by estimating the gage heights using the instrument calibration tool in COHMS. The gage had not been visited during this period of time and the constant flow bubbler was found to be incorrect when observations were made on March 11. A correction of -0.47 ft was used after charting the flows at upstream and downstream gages (PLAMASCO AND PLAMORCO).
Remarks.--	The record is good, except for February 19 - March 11 which are estimated and poor; March 19 and March 21 - 25 which are rated fair after chatter from the constant flow bubbler was eliminated, and April 3 and 4 which are estimated and poor. Station maintained and record developed by Robert D. Erosky.
Recommendations.--	The gage now operates on a separate channel which may go dry in very low flows. It may be necessary to relocate the gage or excavate the channel to move the water back to the gage. Levels must be run in WY2012.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06758500 SOUTH PLATTE RIVER NEAR WELDONA

RATING TABLE-- PLAWELOCO19 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

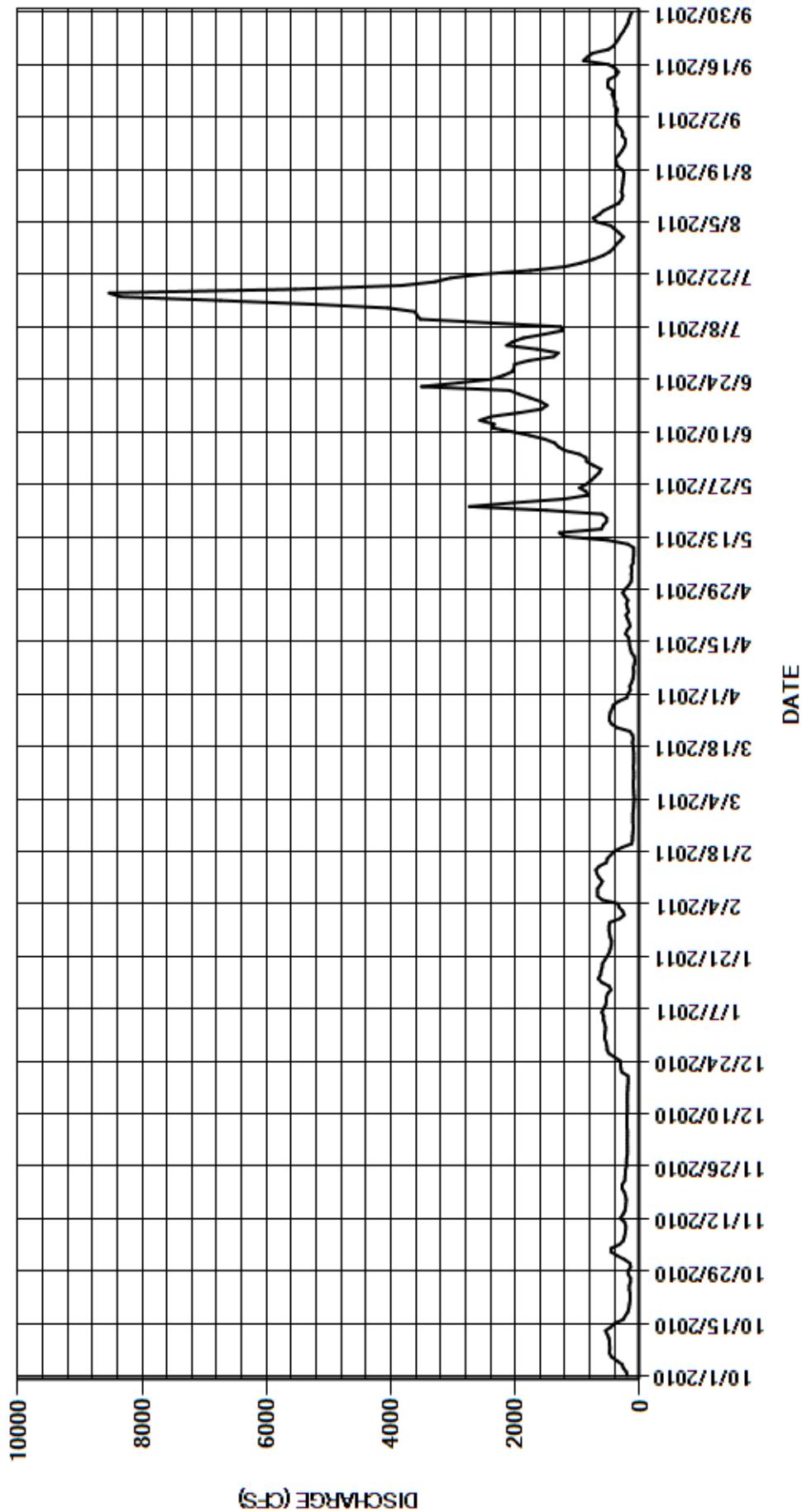
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	203	242	198	554	248	e102	187	138	745	1310	264	374
2	214	358	201	550	274	e97	148	130	854	1650	328	387
3	262	458	202	563	329	e94	e161	135	860	2140	397	374
4	284	458	198	583	349	e88	e132	126	972	2040	471	356
5	368	325	198	581	603	e94	110	138	1210	1870	693	400
6	452	265	202	609	678	e96	100	105	1310	1530	748	396
7	487	247	204	581	680	e101	95	107	1370	1230	648	416
8	482	235	204	545	680	e105	103	96	1530	1270	581	442
9	483	226	203	538	631	e100	84	94	1770	2370	455	429
10	485	224	202	536	601	e94	78	96	2060	3530	336	514
11	495	244	198	516	654	e94	86	194	2370	3580	291	515
12	523	311	198	461	686	101	133	511	2340	3610	271	500
13	550	270	202	493	705	99	149	1210	2570	4050	294	381
14	461	238	201	612	651	94	163	1290	2390	5270	282	343
15	397	228	199	666	533	93	169	612	1950	6740	274	396
16	266	222	196	630	522	94	178	587	1580	8350	266	500
17	231	218	194	622	466	101	227	531	1490	8530	260	905
18	190	228	188	604	403	105	204	530	1590	5540	252	842
19	174	247	187	600	e286	e116	153	607	1760	3830	288	758
20	165	284	189	560	e127	105	168	1500	1940	3290	363	506
21	156	281	287	521	e117	e115	194	2740	2090	3040	377	415
22	157	242	302	490	e116	e159	220	2030	3510	2550	385	375
23	153	236	307	471	e108	e364	177	1220	2920	1760	328	334
24	169	232	312	456	e105	e455	200	834	2380	1210	286	300
25	168	227	400	452	e105	e488	214	861	2190	946	249	257
26	147	213	495	474	e110	483	190	967	2050	746	228	224
27	145	213	524	485	e109	474	236	855	2020	591	230	188
28	183	210	529	496	e109	445	274	781	2010	482	281	174
29	187	200	541	494	---	422	229	718	1770	416	276	152
30	146	198	564	479	---	341	174	654	1380	375	314	127
31	157	---	560	320	---	205	---	622	---	311	367	---
TOTAL	8940	7780	8785	16542	10985	5924	4936	21019	54981	84157	11083	12280
MEAN	288	259	283	534	392	191	165	678	1833	2715	358	409
AC-FT	17730	15430	17430	32810	21790	11750	9790	41690	109100	166900	21980	24360
MAX	550	458	564	666	705	488	274	2740	3510	8530	748	905
MIN	145	198	187	320	105	88	78	94	745	311	228	127
CAL YR	2010	TOTAL	311857	MEAN	854	MAX	10400	MIN	86	AC-FT	618600	
WTR YR	2011	TOTAL	247412	MEAN	678	MAX	8530	MIN	78	AC-FT	490700	

MAX DISCH: 8920 CFS AT 09:45 ON JUL 17,2011 GH 8.68 FT SHIFT -0.58 FT

MAX GH: 8.68 FT AT 09:45 ON JUL 17,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06758500 SOUTHPLATTE RIVER NEAR WELDONA
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06759910 SOUTH PLATTE RIVER AT COOPER BRIDGE NEAR BALZAC
Water Year 2011

Location.--	Lat. N. $40^{\circ} 21'27.5''$, Long. W. $103^{\circ} 31'43''$ (NAD83) in Morgan County, CO, Hydrologic Unit 10190012. Gage is located on the left bank 4.1 miles NE of Snyder, CO and 0.7 miles downstream from the North Sterling Canal diversion structure.
Drainage Area and Period of Record.--	16,600 mi ² (USGS Colorado Streamstats utility). 1916 to October 1, 1987: Various sites and datums at a location approximately 5 miles downstream from the present location at a bridge near the Balzac beet dump near the Washington-Morgan County line. This bridge was locally known as the Balzac Bridge. October 1, 1987 to present: Present site and datum also known as the Cooper Bridge. Diversions from Prewitt Reservoir and a few small irrigation ditches occur between the old Balzac Bridge and Cooper Bridge locations.
Equipment.--	Digital incremental Sutron 56-0540-400-DTR shaft encoder (SE) and Sutron Constant Flow Bubbler (CFB) connected to a Sutron high data rate capable 8210 Data Collection Platform (DCP) and a continuous Steven's water-stage recorder in a 6 ft. by 6 ft. concrete shelter overtop a concrete stilling well equipped with flushing provisions. An electric tape gage located on the instrument shelf is the primary reference with a supplemental outside wire weight gage located on the downstream side of the bridge. Gage had been equipped with Design Analysis and Sutron radar unit to evaluate their performance as well as deployment applicability at this site throughout the water year.
Hydrologic Conditions.--	Channel is braided with heavily vegetated islands and banks. The channel is currently divided by an island extending above and below the bridge. A majority of the flow occurs on the North bank where the gage is located. Flows are generally regulated by heavy regulation upstream of the gage by numerous reservoirs, diversions from and deliveries to the channel. Operations of the North Sterling Canal diversion structure 0.7 miles upstream of the gage will affect flows and operations at the gage. The gage marks the upper extremity of the South Platte River Compact reach. Compact compliance is such that the gage is visited and flushed about every other day.
Gage-Height Record.--	The primary record is 15-minute satellite data taken from the shaft encoder. Backup sources include telemetered 15-minute CFB and radar data as well as DCP logged SE, CFB and radar data as well as chart record. The gage typically stays open due to its proximity of the North Sterling diversion dam but will freeze occasionally. The record tends to have spikes and dips due to the activities of the North Sterling Canal. Frequent flushing of the stilling well required for good operation of the gage will also show dips in data. The record is complete and reliable except for: December 26, 2010; January 18, 24, 26, 27, 30; February 2, 7, 20 – 24; April 4, 15; May 1, 2, 20, 23; June 1, 7, 20; July 10, 11, 14, 29-31; August 1, 8, 21, 22; September 2, 18-19, 2011 when the inlets were plugged or sluggish; and, February 10-12, 2011 when the stage-discharge relation was affected by ice. Missing or bad values were filled in with chart record on August 24, September 13 and 15 without loss of accuracy. Seven hours of radar data were used on April 27 to fill in missing SE data. Inlet flushing operations require pumping water from the stilling well into the flushing basin. This practice causes the stage to momentarily dip in the stilling well. Values affected by this practice were manually adjusted.
Datum Corrections.--	Levels were last run on July, 27, 2009. The electric tape gage and wire weight gage were found to be reading correctly.
Rating.--	The control is a rapidly shifting sand channel with flow in several braids at low stages. At very high stages, the flow spreads into heavily vegetated areas. Rating PLABALCO04, put into use on October 1, 2009, was continued for use thru the water year. PLABALCO04 was originally developed from measurements made in the 2009 water year but was subsequently extended on Jun 15, 2010 using measurement Nos. 593 (6560 cfs) and 594 (7940 cfs). The high water end was taken from an equation fit through historic points. Thirty-two current meter measurements (Nos. 607 - 638) were made this year ranging in discharge from 15.1 to 8,030 cfs covering the range in stage experienced this year well except for the lower daily flow on May 6. The peak flow of 8,690 cfs occurred at 2115 July 17, 2011 at a gage height of 9.06 ft with a shift of 0.48 ft. It exceeded Measurement No. 632, made July 18, by 0.35 ft in stage.
Discharge.--	Shifting control method was used all year. Shifts are caused by the movement of sand into and out of the section as well as vegetal growth on the banks and islands in the channel. Diversion practices from the North Sterling Canal can dramatically affect the amount of sand moving through the section on almost an instantaneous basis. Measurements made this year showed shifts ranging from -0.04 ft to 0.49 ft. Shifts were distributed as follows: October 1 – December 14, 2010: time proration as defined by Measurement Nos. 606 through 612. December 14, 2010 – January 19, 2011: stage dependent shifting using variable shift table PLABALCOWY11-01 defined by Measurement Nos. 612-615 made during the period of use and No. 627 to define the upper end of the table. January 19 – March 30, 2011: stage dependent shifting using variable shift table PLABALCOWY11-02 defined by Measurements 615-620 made during the period of use as well as Nos. 614 and 627 used to define the upper end of the table. March 30 – May 2, 2011: time proration with consideration given to change in stage as defined by Measurement Nos. 620-623. May 2 – June 23, 2011: stage dependent shifting using variable shift table PLABALCOWY11-03 defined by Measurements 624-628 made during the period of use and No. 631 used to define the upper end of the table. June 23 – July 18, 2011: stage dependent shifting using variable shift table PLABALCOWY11-04 defined by Measurement Nos. 628-632 made during the period. July 18 – September 2, 2011: stage dependent shifting using variable shift table PLABALCOWY11-05 defined by Measurement Nos. 632-636 made during the period use as well as Nos. 627 and 628 used in previous tables which add definition to the table. September 2 – 30, 2011: stage dependent shifting using variable shift table PLABALCOWY11-06 defined by Measurement Nos. 636- 638 made during the period of use as well as No. 633 used in a previous table that helped add definition to the table. All measurements were given full weight except for Nos. 615, 617, 620, 626-628, 633, 636 and 637 which were adjusted 3 to -5% to smooth shift distributions.

Special Computations.--	Hourly gage heights for the days of plugged inlets or ice cover were estimated graphically on the chart. The new computed daily discharge was compared to the old discharge and depending on the percentage of change in discharge, the record was considered either good, fair or poor.
Remarks.--	Record is good to fair, except for February 24; July 10, 11, 14, 15, 29, 30, 31; and August 1 which are poor due to inlet and/or instrument issues. February 10 -12 are poor due to ice. Channel and rating instability will always be an issue at this gage. Station maintained and record developed by Robert D. Erosky and Russell V. Stroud.
Recommendations.--	Visitation every few days is required due to channel instability.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06759910 SOUTH PLATTE RIVER AT COOPER BRIDGE NEAR BALZAC

RATING TABLE-- PLABALCO04 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

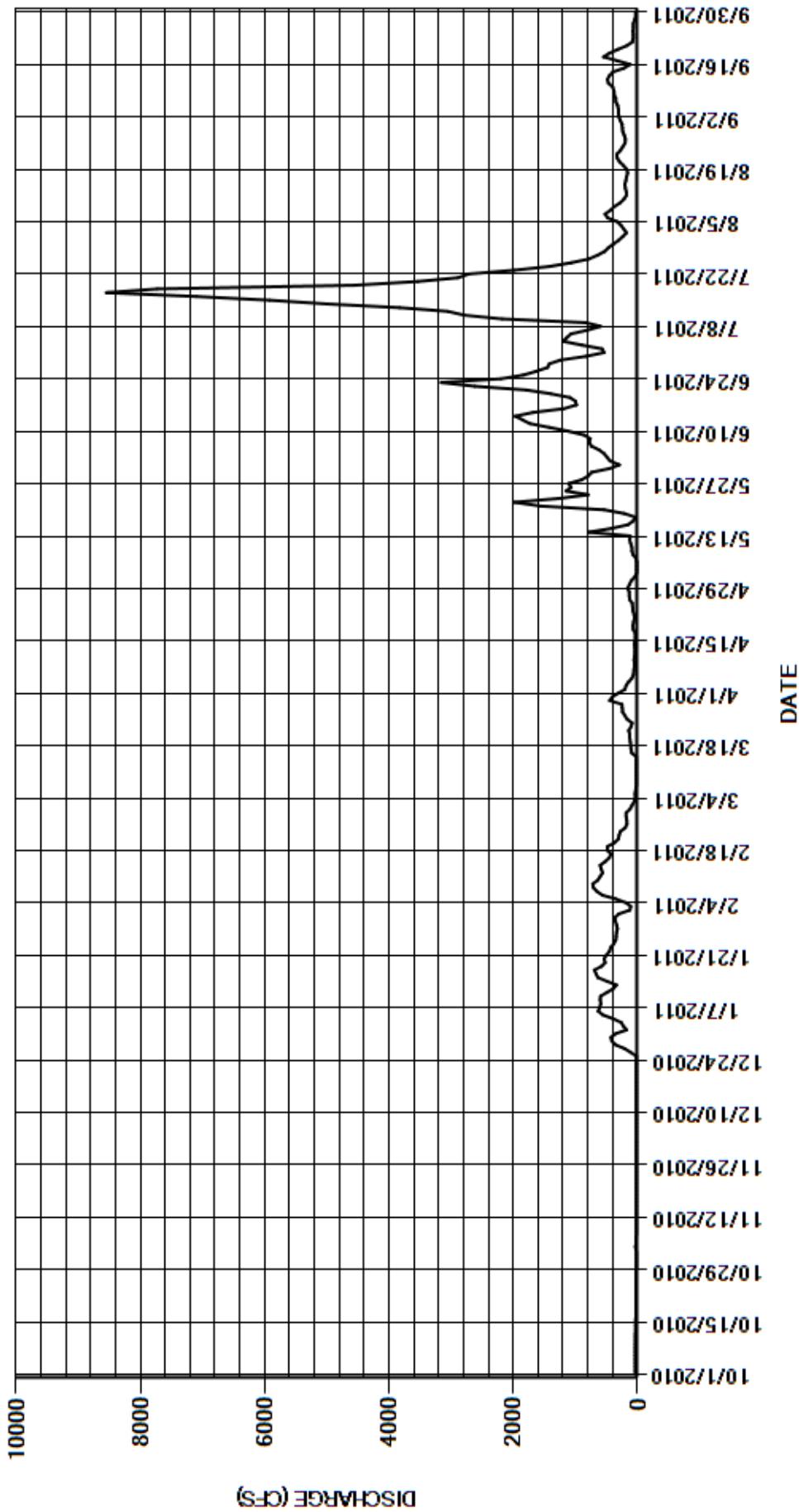
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	41	22	17	176	300	122	308	e103	e292	540	e239	277
2	40	22	17	230	e125	90	204	e47	440	571	180	e301
3	39	23	17	265	110	55	186	16	491	895	222	307
4	40	35	17	397	188	37	e145	15	538	1200	267	309
5	41	25	17	560	350	43	91	15	622	1140	330	321
6	41	23	17	634	568	31	65	14	746	1070	482	350
7	41	23	17	610	e655	23	60	26	e779	808	525	353
8	40	22	17	593	711	22	54	74	762	596	e439	379
9	37	22	17	602	722	21	53	91	866	838	376	381
10	36	21	17	597	e641	21	56	93	1120	e2180	282	402
11	36	21	18	495	e602	21	49	113	1420	e2790	220	471
12	36	20	18	393	e563	21	43	128	1730	3050	181	485
13	35	20	18	340	586	21	44	119	1850	3830	183	454
14	34	20	18	494	603	21	54	790	1970	e5000	198	398
15	32	19	18	641	520	21	e46	421	1680	5920	205	220
16	29	20	18	670	455	95	36	155	1190	7100	189	120
17	28	20	18	696	426	107	36	70	985	8550	178	327
18	28	19	18	e579	490	109	71	32	1000	7730	162	e549
19	28	19	18	522	485	118	77	217	1090	4550	177	e453
20	27	20	18	541	e375	126	64	e542	e1400	3540	228	319
21	27	20	19	501	e309	126	51	1570	1790	2890	e291	175
22	27	20	21	452	e299	144	56	1990	2620	2720	e329	84
23	27	19	19	435	279	108	77	e1270	3160	1990	335	72
24	26	18	19	e383	e199	88	81	795	2200	1420	277	73
25	26	18	19	352	172	168	86	1150	1840	1070	240	76
26	25	18	e113	e344	175	206	129	1070	1630	784	202	68
27	24	18	209	e341	184	244	133	1110	1450	647	196	68
28	23	18	354	324	185	247	134	902	1420	533	213	46
29	23	18	416	338	---	252	161	797	1240	e472	239	30
30	22	17	430	e356	---	450	133	741	830	e390	245	29
31	22	---	353	368	---	407	---	454	---	e306	250	---
TOTAL	981	620	2322	14229	11277	3565	2783	14930	39151	75120	8080	7897
MEAN	31.6	20.7	74.9	459	403	115	92.8	482	1305	2423	261	263
AC-FT	1950	1230	4610	28220	22370	7070	5520	29610	77660	149000	16030	15660
MAX	41	35	430	696	722	450	308	1990	3160	8550	525	549
MIN	22	17	17	176	110	21	36	14	292	306	162	29
CAL YR	2010	TOTAL	260366	MEAN	713	MAX	10500	MIN	17	AC-FT	516400	
WTR YR	2011	TOTAL	180955	MEAN	496	MAX	8550	MIN	14	AC-FT	358900	

MAX DISCH: 8690 CFS AT 21:15 ON JUL 17,2011 GH 9.06 FT SHIFT 0.48 FT

MAX GH: 9.06 FT AT 21:15 ON JUL 17,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06759910 SOUTH PLATTE RIVER AT COOPER BRIDGE NEAR BALZAC
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06763990 SOUTH PLATTE RIVER AT JULESBURG (RIGHT CHAN. #2)
Water Year 2011

Location.--	Lat. 40°58'37", Long. 102°14'52", in NE 1/4 SE 1/4 sec. 33, T.12 N., R.44 W., Sedgwick County, on right bank of channel No 2 (right channel) 5 ft downstream from bridge on U.S. Highway 385, 0.9 mi southeast of Julesburg, 3.0 mi upstream from Colorado-Nebraska State line, and 8 mi downstream from Lodgepole Creek.
Drainage Area and Period of Record.--	23,821 mi ² . April 1902 to current year. Monthly data only for some periods. Published as near Julesburg and at Ovid in earlier years. Water quality data available from 1945 to 1995.
Equipment.--	Sutron AccuBubble stage sensor connected to a Sutron 8210 DCP. A wire weight gage on the bridge is the primary reference gage.
Hydrologic Conditions.--	The South Platte channel at Julesburg is braided. Channel 2 is one of four channels. The river is gaged on channels 1, 2, and 4, and a combined flow record is published for South Platte River at Julesburg. (The gage on Channel 4 has not been functional due to ponding conditions. GH's were not recorded at Channel 4 but a record was estimated. Channel 4 receives intermittent runoff from agriculture and storms, and in some years there is well augmentation water delivered down the channel.) Generally the river is dried up by diversions at many points upstream. Julesburg flow is usually comprised of return flows or water passed to Nebraska to meet Compact requirements (April 1- October 15, CRS: 37-65-101). During the winter, however, periods of higher flow can be seen as upstream supply is diverted less heavily and fewer dry up locations occur. However, upstream diversions continue throughout the winter, except for periods of severe cold interrupting recharge and reservoir storage operations. Channels 1 and 2 split apart about 1/3 mile upstream from the gage and the proportion of water in Channel 1 has been increasing in recent years. At low flows, nearly all the flow is in Channel 1 with Channel 2 having little flows to being dry.
Gage-Height Record.--	The primary record is 15-minute telemetered Accububle data with 15-minute logged DCP data as backup. The record is complete and reliable except for: October 4-15, 2010 and April 11-28, 2011 when the slope value for the sensor was accidentally changed; December 31, 2010, January 1-5, 8-13, 31, and February 1-4, 8-12 2011, when ice formed on the orifice. One to two unit values considered being erroneously low occurred on December 23, 25, 27, 28, 2010, March 3, 5, 7, 9, 10, 13, 14, May 7, 8, 12-16 and June 27, 2011 and were replaced using adjacent unit values without loss of accuracy. Instrument calibration was supported by 47 visits to the gage. Instrument calibration corrections were primarily in the range of +/-0.05 ft, however, there were two large offsetting sequential corrections of +0.95 ft. and -0.94 ft during the higher flow period from June 27 to July 21, 2011. Corrections were applied as defined by visits.
Datum Corrections.--	Levels were last run on April 10, 2004.
Rating.--	The control is the shifting sand channel which has historically exhibited scour and fill activity. Flow in the channel has been infrequent in recent years, resulting in marsh like conditions at the gage without visible flow. The low flow control is regularly confounded by grooved tracks of 4-wheel drive vehicles in the semi-dry channel just below the gage. Heavy vegetal growth in the channel has shown measurements plotting to the left of older ratings. Rating No. 19 (PLAJURCO19) was used from October 1, 2010 through May 23, 2011. Rating No. 21 (PLAJURCO21) developed this year was used for the remainder of WY2011. It is defined by measurements from 0.77 to 1820 cfs made in the 2011 Water Year. Twenty-eight discharge measurements (Nos. 388-415) were made during the year by Colorado Division of Water Resources and Nebraska Department of Natural Resources personnel, ranging in discharge from 0.00 to 1820 cfs. Msmts 388, 396-398 and 413, made by Nebraska DNR personnel, were visual estimates of flow, and included an estimate of zero flow (No. 388) on Oct 8, 2010. The peak flow of 1850 cfs occurred at 0915 on July 21, 2011 at a gage height of 7.57 ft with a shift of 0.00 ft. It exceeded the high flow measurement (No. 407) made two hours later by 30 cfs and 0.02 ft. of stage.
Discharge.--	Shifts are due to backwatering caused by constant and abundant vegetative growth in the channel during the last few years. Previous to the current channel conditions, shifts were caused by the movement of sand. Shifting control method was used for all periods of open water this year. Measurements made show shifts ranging from -0.59 to +0.07 ft. Shifts were distributed by time with consideration given to change in stage. Variable shift table PLAJURCOVST11-1 was used to distribute shifts by stage for the period from June 27 through July 21, 2011. It is defined by three measurements (Nos. 405-407) made during the period of use. All measurements were give full weight, except for Nos. 403 and 412, which were discounted 1.4 and 7.6%, respectively, in order to smooth shift transitions.
Special Computations.--	Discharge for the periods of bad gage-height record were estimated from adjacent good record and visual estimations of flow made during the affected period. Similarly discharges for the ice affected periods were estimated from adjacent good record and estimates of flow made near the affected period. The record is added to the records from Channels 1 and 4 to form the record for the South Platte River at Julesburg Combined Flow.
Remarks.--	The record is good except for periods of ice affected record and periods of instrument malfunction, which are estimated and poor. Daily discharges below 0.51 cfs including observations of zero flow occurring on October 1 – December 30, 2010, February 6, 7, March 15 – May 10 and August 21-28, 2011 are considered fair. Due to the uncertainty in gage height record during the period of application of the two large offsetting instrument calibration corrections, June 27- July 21, 2011, this period is considered fair. The peak instantaneous flow for the year occurred at the end of this period and was verified by Msmt 407 made within two hours on the same day and is rated good. Station maintained and record developed by Division One Hydrographic staff.

Recommendations.--

The DCP for this site should be upgraded to a SatLink2 a with display unit. This would hopefully prevent accidental changes to the Accububble slope. Levels should be run in WY2012.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06763990 SOUTH PLATTE RIVER AT JULESBURG (RIGHT CHAN. #2)

RATING TABLE-- PLA JUR CO19 USED FROM 01-OCT-2010 TO 23-MAY-2011
PLA JUR CO21 USED FROM 23-MAY-2011 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.27	e0.30	e0.70	0.94	0.19	0.42	53	56	2.4	0.67
2	0.00	0.00	0.34	e0.30	e0.60	0.78	0.21	0.40	35	41	1.8	0.58
3	0.00	0.00	0.44	e0.20	e0.50	0.89	0.12	0.43	12	40	1.6	0.55
4	e0.00	0.00	0.36	e0.30	e0.40	0.75	0.08	0.42	4.8	47	1.4	0.54
5	e0.00	0.00	0.31	e0.50	0.53	0.77	0.13	0.40	2.9	52	1.3	0.56
6	e0.00	0.00	0.32	0.85	0.49	0.74	0.12	0.41	2.0	46	1.0	0.57
7	e0.00	0.00	0.34	4.9	0.46	0.62	0.15	0.40	1.3	40	0.97	0.56
8	e0.00	0.00	0.31	e2.0	e0.40	0.60	0.14	0.37	1.0	30	0.87	0.62
9	e0.00	0.00	0.37	e1.0	e0.40	0.59	0.18	0.36	0.98	24	0.94	0.60
10	e0.00	0.00	0.38	e1.0	e0.30	0.63	0.26	0.47	0.85	17	1.2	0.68
11	e0.00	0.00	0.25	e2.0	e0.20	0.63	e0.30	0.59	0.92	14	1.1	0.73
12	e0.00	0.00	0.20	e4.0	e0.30	0.57	e0.40	0.97	1.4	56	1.0	0.81
13	e0.00	0.00	0.26	e6.0	2.0	0.51	e0.50	0.77	6.4	202	0.92	0.88
14	e0.00	0.00	0.41	8.5	2.8	0.47	e0.50	0.80	22	530	0.86	0.82
15	e0.00	0.00	0.45	32	21	0.45	e0.40	0.79	35	817	0.84	1.0
16	0.00	0.00	0.36	61	33	0.44	e0.30	0.79	45	916	0.72	1.0
17	0.00	0.00	0.32	34	7.0	0.39	e0.30	0.75	47	1070	0.67	1.2
18	0.00	0.00	0.35	4.8	2.2	0.39	e0.30	0.92	33	1220	0.65	1.2
19	0.00	0.00	0.42	8.8	1.5	0.38	e0.30	1.1	23	1400	0.53	1.2
20	0.00	0.00	0.46	2.3	1.3	0.35	e0.30	0.77	45	1630	0.50	1.1
21	0.00	0.00	0.36	1.5	1.2	0.31	e0.30	0.66	64	1670	0.47	1.2
22	0.00	0.07	0.34	1.3	1.2	0.31	e0.30	0.59	83	823	0.40	1.2
23	0.00	0.09	0.36	1.1	1.1	0.23	e0.30	11	106	486	0.38	1.2
24	0.00	0.12	0.35	1.0	0.91	0.19	e0.30	88	147	374	0.32	1.2
25	0.00	0.13	0.33	0.94	0.78	0.18	e0.30	119	201	265	0.33	1.2
26	0.00	0.15	0.35	0.85	0.89	0.17	e0.30	130	163	174	0.32	1.0
27	0.00	0.21	0.40	0.89	0.97	0.11	e0.40	134	117	113	0.32	0.93
28	0.00	0.28	0.43	0.89	0.93	0.10	e0.40	120	95	70	0.31	0.88
29	0.00	0.27	0.43	0.79	---	0.10	0.49	112	83	33	0.49	0.74
30	0.00	0.24	0.34	0.72	---	0.19	0.45	91	75	11	0.72	0.69
31	0.00	---	e0.30	e0.70	---	0.23	---	71	---	3.9	0.70	---
TOTAL	0.00	1.56	10.91	185.43	84.06	14.01	8.72	889.58	1506.55	12270.9	26.03	26.11
MEAN	0.000	0.052	0.35	5.98	3.00	0.45	0.29	28.7	50.2	396	0.84	0.87
AC-FT	0	3.1	22	368	167	28	17	1760	2990	24340	52	52
MAX	0.00	0.28	0.46	61	33	0.94	0.50	134	201	1670	2.4	1.2
MIN	0.00	0.00	0.20	0.20	0.20	0.10	0.08	0.36	0.85	3.9	0.31	0.54

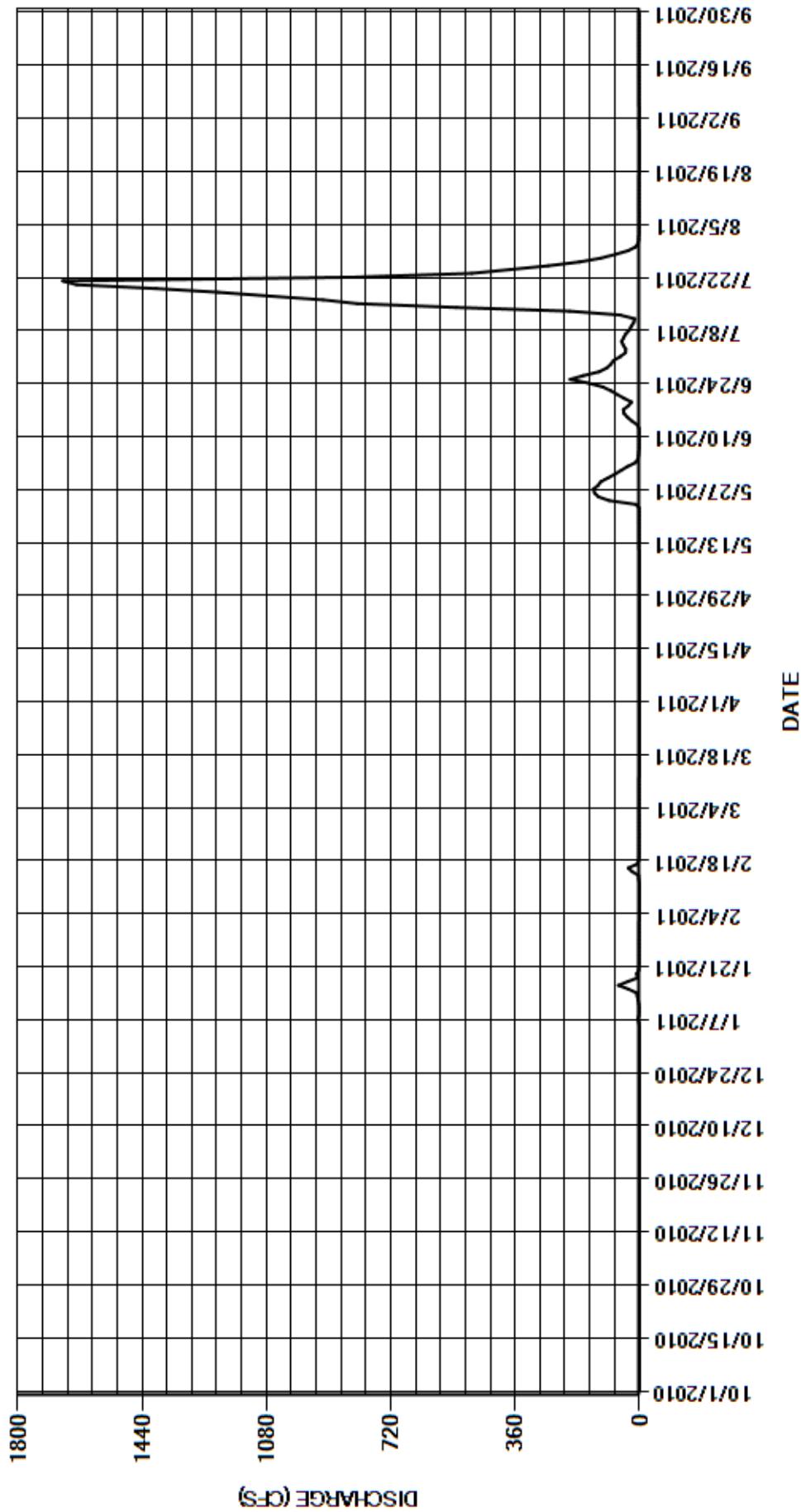
CAL YR	2010	TOTAL	63691.94	MEAN	174	MAX	5130	MIN	0.00	AC-FT	126300
WTR YR	2011	TOTAL	15023.86	MEAN	41.2	MAX	1670	MIN	0.00	AC-FT	29800

MAX DISCH: 1850 CFS AT 09:15 ON JUL 21,2011 GH 7.57 FT SHIFT 0 FT

MAX GH: 7.57 FT AT 09:15 ON JUL 21,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06763990 SOUTH PLATTE RIVER AT JULESBURG (RIGHT CHAN. #2)
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
SOUTH PLATTE RIVER AT JULESBURG (CHANNEL #1)
Water Year 2011

Location.--	Lat. 40°58'37", Long. 102°14'52", in NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 33, T.12 N., R.44 W., on Highway 385 bridge south of Julesburg CO.
Drainage Area and Period of Record.--	23,821 mi ² . 1995 to current year.
Equipment.--	Sutron Constant Flow Bubbler (CFB) connected to a SatLink 2 Data Collection Platform DCP in a NEMA enclosure. A wire weight gage located on the bridge is the primary reference for the gage, with a supplemental staff located on the bridge pier closest to the shelter. The staff reads 1.17 ft lower than the wire weight, which occasionally leads to confusion. On August 26, 2011, the Constant Flow Bubbler was replaced with a new CFB. The old CFB was not tracking well.
Hydrologic Conditions.--	The South Platte channel at Julesburg is braided. Channel 1 is one of four channels, which can contain flow. The river is gaged on Channels 1, 2, and 4, and a combined flow record is published for South Platte River at Julesburg (PLAJUCCO). Channels 1 and 2 split apart about 1/3 mile upstream from the gage and the proportion of water in Channel 1 has been increasing in recent years. At low flows, 90-100% of the flow is in Channel 1, with Channels 2 and 3 being dry and some local irrigation and storm runoff in Channel 4. Channel 2 and Channel 3 will have water only at high flows. Generally the river is dried by multiple diversions upstream. Julesburg flow is usually comprised of return flows or water passed to Nebraska to meet Compact requirements (April 1- October 15, CRS: 37-65-101). However, during the winter, periods of higher flow can be seen as upstream supply is diverted less heavily and fewer dry up locations occur. Upstream diversions continue throughout the winter, except for periods of severe cold interrupting recharge and reservoir storage operations.
Gage-Height Record.--	The primary record is 15-minute telemetered CFB data with 15-minute logged DCP data as backup. The record is complete and reliable except for: December 31, 2010 – January 17, 2011, February 2-5 and 8-12, 2011 when the stage-discharge relationship was affected by ice; ; June 3-7, June 30-July 5, July 13-19, July 24-August 1, 2011 when numerous calibration corrections of large magnitude occurred to the CFB unit; August 24-26, 2011 when the CFB unit was not operating correctly; and August 27-September 3, 2011 when CFB performance was questionable. On November 25 and 26, 2010 and August 17, 2011 several values were logged erroneously high or low. Bad values were replaced by interpolating from adjacent good record without loss of accuracy
Datum Corrections.--	Instrument calibration was supported by over 120 visits to the gage and 37 adjustments to the instrument ranging from +0.11 ft to -0.60 ft. Distribution of adjustments was by time proration from the last point of known good calibration to the point of adjustment, except for: December 6-7, 2010; January 7 -18, March 31-April 1, June 3-7, June 14-27, June 30-July 5 and July 15-19, 2011 which were distributed by event or from points when the instrument calibration became suspect.
Rating.--	Levels were last run on August 24, 2011 using RM 4 as base. No correction was necessary. The base reference was moved 45-ft. to the south at the time of levels. No change to gage datum. The level used was a Sokkia C320 (S/N 445603) which passed a two peg test made on August 23 2011.
Discharge.--	Shifting sand channel control throughout the entire range of expected flow. The channel has tended to scour during high flow events and then slowly fill back in. An island has developed in the channel about 200-ft. downstream of the gage and can collect debris. Rating No. 8 (ONEJURCO08) developed in the 2010 Water Year was used for all of WY2011. Forty-one discharge measurements (Nos. 632-672) were made during the year by Colorado Division of Water Resources and Nebraska Department of Natural Resources personnel, ranging in discharge from 104 to 4730 cfs. Measurements made this year cover the range in stage experienced this year well. The peak flow of 4760 cfs occurred at 0815 on July 21, 2011 at a gage-height of 8.75 ft with a shift of +0.48 ft. It exceeded the high flow measurement (No. 665) made two hours later on the same date by 30 cfs and 0.02 ft. of stage respectively.
Special Computations.--	Discharge for the ice affected period was estimated from adjacent good record with respect to temperature trends and known diversions occurring to the system upstream of the gage. Discharge for periods of poor instrument performance were estimated from adjacent good record and measurements made during such periods. This record is added to the records from channels 2 and 4 to form the record for the South Platte River at Julesburg, Combined flow.
Remarks.--	The record is good except as follows: the ice affected periods of December 31, 2010-January 17, 2011, February 2-5 and 8-12, 2011, which are estimated and poor; June 3-7, June 30 - July 5, July 13-19, August 24-26, 2011, when instrument calibration was significantly impaired, the record is estimated and poor; August 27-September 3, 2011 when the instrument was not accurately tracking events, record is fair. Station maintained and record developed by Div. 1 staff.
Recommendations.--	

Continue making regular discharge measurements and when needed on an event driven basis to tack the full range in stage experienced. Better coordination with Nebraska personnel and conformity to standard measurement practices should be strived for. Watch for debris accumulation on the island and banks downstream of the gage. A Campbell Scientific radar unit has been procured for this site. Hopes are that this unit will maintain calibration better than the CFB unit did this past year. The CFB will remain in place and serve as a backup instrument. Installation of the radar unit should take place as soon as feasibly possible.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SOUTH PLATTE RIVER AT JULESBURG (CHANNEL #1)

RATING TABLE-- ONEJURCO08 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

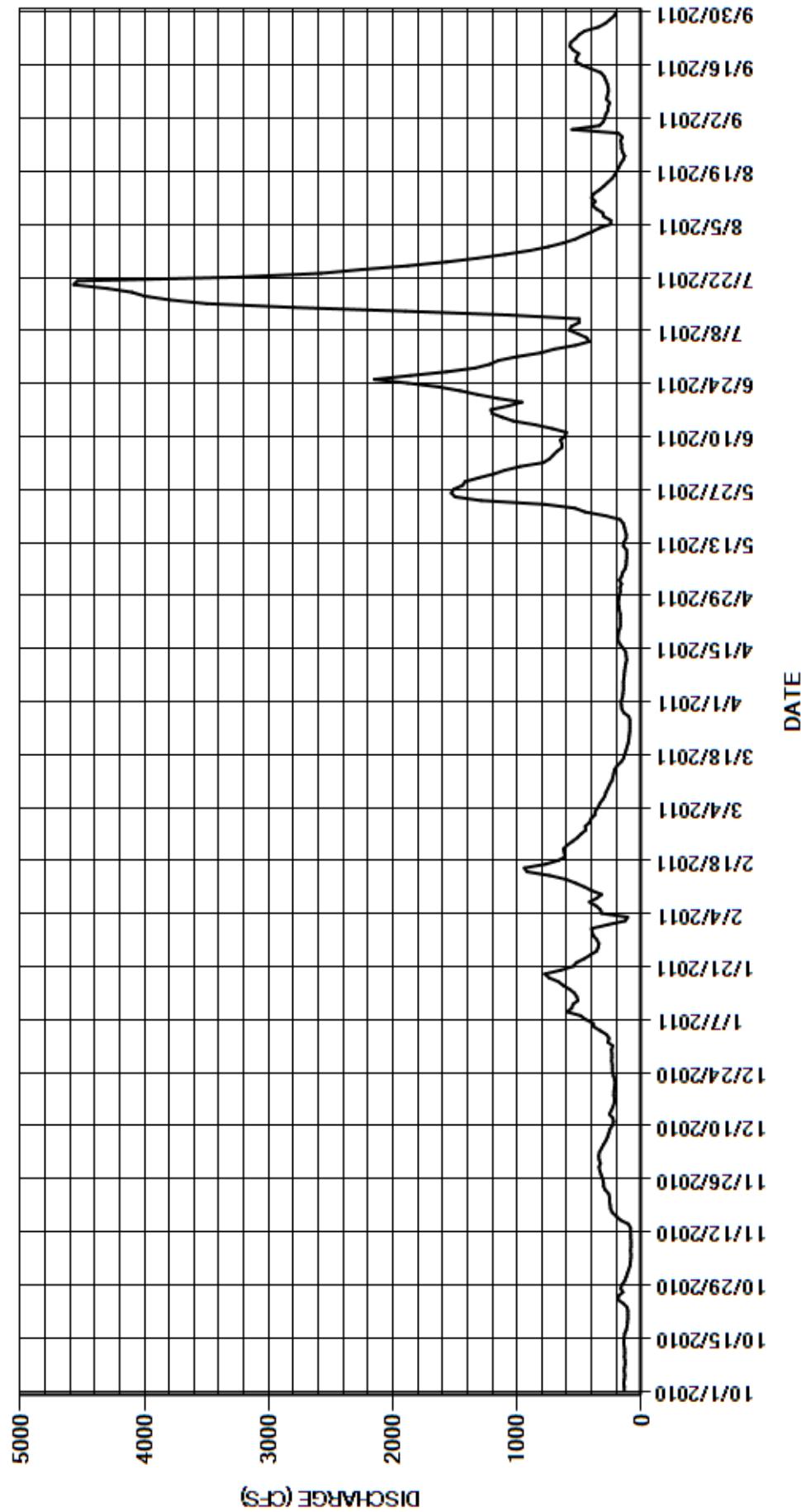
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	138	112	340	e270	273	405	163	172	1100	e1000	535	307
2	138	101	343	e260	e130	375	152	160	977	e810	469	293
3	142	91	337	e280	e110	370	148	177	e790	e700	397	287
4	137	88	320	e330	e320	348	145	159	e740	e530	335	270
5	133	85	304	e380	e330	335	145	151	e710	e420	245	268
6	137	84	286	e390	365	313	146	131	e680	441	246	255
7	136	87	272	e450	418	294	141	123	e640	508	303	281
8	131	84	262	e490	e360	285	138	122	640	581	312	273
9	132	84	253	e600	e320	269	135	118	652	563	361	266
10	137	85	234	e560	e400	256	131	117	614	502	397	267
11	133	85	223	e550	e460	237	125	120	604	501	372	274
12	135	86	231	e510	e530	229	118	145	715	1070	401	287
13	139	87	258	e520	608	222	123	141	854	e1900	384	299
14	141	106	241	e540	740	215	125	123	1030	e2800	340	326
15	138	168	228	e580	921	195	146	121	1120	e3500	303	404
16	135	201	219	e630	942	162	170	130	1200	e3800	271	481
17	122	234	217	e670	770	143	187	137	1210	e4000	237	529
18	115	248	222	744	667	134	188	146	1070	e4100	215	522
19	112	251	220	777	612	124	186	172	961	e4300	197	504
20	109	258	218	649	620	116	176	291	1160	4570	181	550
21	109	256	212	549	627	106	168	454	1320	4540	166	575
22	109	264	214	522	598	101	168	534	1460	3260	146	568
23	115	291	224	462	555	98	170	779	1630	2580	135	530
24	145	305	232	412	515	94	169	1290	1880	2250	e150	502
25	190	306	234	362	484	92	177	1500	2150	1880	e160	456
26	183	312	234	348	448	92	180	1530	1860	1570	e160	346
27	148	324	239	342	452	92	186	1510	1570	1320	168	290
28	167	334	238	357	418	101	182	1440	1340	1100	153	254
29	155	341	238	384	---	142	177	1420	1220	901	186	218
30	134	330	241	396	---	158	169	1310	e1150	750	558	203
31	122	---	e230	401	---	161	---	1190	---	630	338	---
TOTAL	4217	5688	7764	14715	13993	6264	4734	15913	33047	57377	8821	10885
MEAN	136	190	250	475	500	202	158	513	1102	1851	285	363
AC-FT	8360	11280	15400	29190	27760	12420	9390	31560	65550	113800	17500	21590
MAX	190	341	343	777	942	405	188	1530	2150	4570	558	575
MIN	109	84	212	260	110	92	118	117	604	420	135	203
CAL YR	2010	TOTAL	234140	MEAN	641	MAX	4730	MIN	84	AC-FT	464400	
WTR YR	2011	TOTAL	183418	MEAN	503	MAX	4570	MIN	84	AC-FT	363800	

MAX DISCH: 4760 CFS AT 08:15 ON JUL 21,2011 GH 8.75 FT SHIFT 0.48 FT

MAX GH: 8.75 FT AT 08:15 ON JUL 21,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTHPLATTE RIVER AT JULESBURG (CHANNEL #1)
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06763980 SOUTH PLATTE RIVER AT JULESBURG (LEFT CHAN. #4)
Water Year 2011

Location.--	Lat. 40°58'46", Long. 102°15'15", in NW 1/4 NE 1/4 sec. 33, T.12 N., R.44 W., Sedgwick County, Hydrologic Unit 10190018, on left bank of channel No 4 (left channel) 215 ft downstream from bridge on U.S. Highway 385, 0.9 mi southeast of Julesburg, 3.0 mi upstream from Colorado-Nebraska State line, and 8 mi downstream from Lodgepole Creek.
Drainage Area and Period of Record.--	23,821 mi ² .
Equipment.--	Metal pipe shelter and well. Supplemental outside chain gage. No recording equipment.
Hydrologic Conditions.--	Channel 4, the furthest channel to the North, splits off Channel 2 somewhere upstream from the point where Channel 1 splits from Channel 2. During the drought years 2000-2004, Channel 4 filled with vegetation and became swampy and ponded. Stream gaging of channel 4 was abandoned beginning in water year 2008. When river upstream reaches around 2000 cfs, some water begins to be dumped into the channel; but there is no stage-discharge relationship maintained. It is difficult to find sections where measurement might be possible. The State of Colorado is obliged to keep a record of flow in this channel for the South Platte River Compact with Nebraska. Presently at Compact level (120 cfs), no flow from the main river is in Channel 4, however, some base flow exists from seepage and local runoff sources. The record at Channel 4 estimates these base flows. These base flows are usually insignificant to the total river at high flows, but can become a significant percentage of the total in a dry summer. The Town return ditch contains much—but not all—of the local runoff, occasional irrigation return flows, and some well augmentation water. It is active during the irrigation season, but is dry in the winter months except for an occasional day or two of storm runoff.
Gage-Height Record.--	No gage height record is kept at the Channel 4 gage.
Datum Corrections.--	N/A.
Rating.--	Rating 22 was the last active rating used at Channel 4. Due to the typically swampy, ponded conditions around the gage, and the removal of recording equipment from the gage, there is no gage height record, nor is there any attempt to maintain or update Rating 22. Discharge is estimated during periods when ponding is present. Discharge measurements are made during periods of live flow. During WY2011, there were 16 measurements or estimates (Nos. 474-477) of discharge made. Four measurements of zero flow were made (Nos. 474-477). Five estimates of discharge ranging from 0.50 to 1.00 cfs (Nos. 479-482, 489) were made during periods of ponding around the gage. Seven "live flow" discharge measurements were made (Nos. 478, 483-488) ranging from 0.33 cfs to 875 cfs were made.
Discharge.--	Discharge was estimated for the entire year. See next section.
Special Computations.--	Estimated record. Discharge was estimated for the entire year using flow estimates and actual measurements of live flow discussed above, along with trends in flow in Channel 2 and temperature data collected at the gage. Discharge measurements were made either upstream or downstream of bridge. The Town of Julesburg Return Ditch was added in when measurements are made upstream of the bridge. Estimated maximum mean daily discharge for the WY is 875 cfs occurring on July 21 2011, and is the same discharge as Msmt. 486 made the same day.
Remarks.--	The record is estimated and poor. The gage is no longer operated due to ponding and the lack of a stage-discharge relationship. Record contains estimates for unmeasurable base flows from local sources. This record is added to the records from Channels 1, 2, and Sewer Plant to form the record for South Platte River at Julesburg, Combined Flow. Record developed by Devin Ridnour.
Recommendations.--	The Channel 4 gage could be reestablished if extensive machine work cleared the channel of vegetation. However, the efficacy of such an effort is questionable. A bubbler instrument would be needed as maintenance of the stilling well and intakes was extremely difficult (due to the mud and swamping) prior to the gage's discontinuation.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06763980 SOUTH PLATTE RIVER AT JULESBURG (LEFT CHAN. #4)

RATING TABLE-- PLAULCO22 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

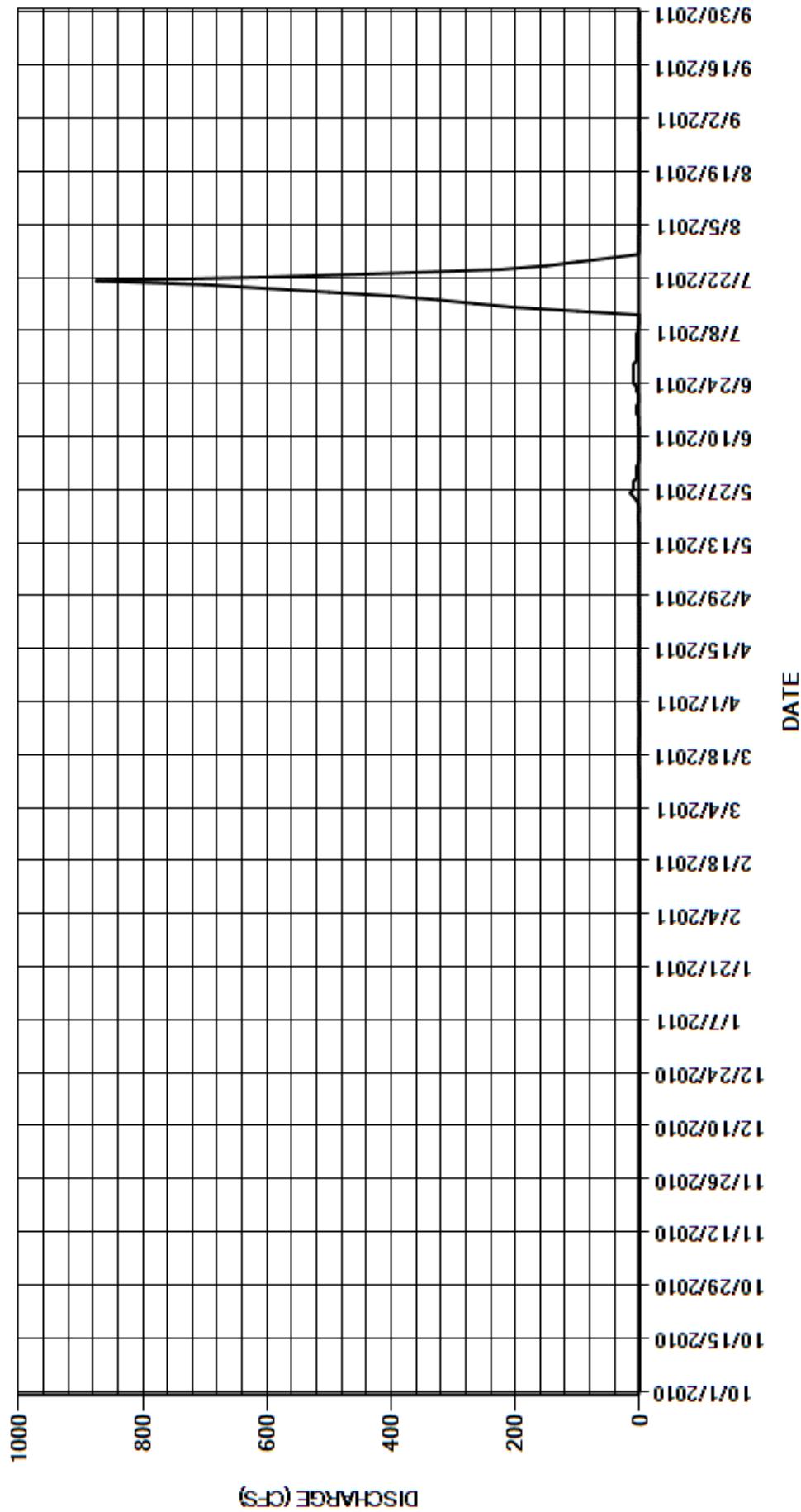
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	e1.0	e1.0	e5.0	e5.0	e1.0	e0.50
2	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	e1.0	e1.0	e5.0	e5.0	e1.0	e0.25
3	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	e0.75	e1.0	e2.0	e5.0	e0.75	e0.25
4	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	e0.75	e1.0	e1.0	e5.0	e0.75	e0.25
5	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	e0.75	e1.0	e1.0	e5.0	e0.75	e0.25
6	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	e0.75	e1.0	e1.0	e5.0	e0.50	e0.25
7	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	e0.75	e1.0	e1.0	e5.0	e0.50	e0.25
8	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	e0.75	e1.0	e1.0	e2.0	e0.50	e0.25
9	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	e0.75	e1.0	e1.0	e2.0	e0.50	e0.25
10	e0.00	e0.00	e0.00	e0.00	e0.00	e0.25	e0.75	e1.0	e1.0	e1.0	e0.25	e0.25
11	e0.00	e0.00	e0.00	e0.00	e0.00	e0.25	e0.75	e1.5	e1.0	e1.0	e0.25	e0.25
12	e0.00	e0.00	e0.00	e0.00	e0.00	e0.50	e0.75	e1.5	e1.0	e1.0	e0.25	e0.25
13	e0.00	e0.00	e0.00	e0.00	e0.00	e0.50	e1.0	e1.0	e2.0	e100	e0.25	e0.25
14	e0.00	e0.00	e0.00	e0.00	e0.00	e0.75	e1.0	e1.0	e2.0	e200	e0.25	e0.25
15	e0.00	e0.00	e0.00	e0.00	e0.00	e1.0	e0.75	e1.0	e2.0	e265	e0.25	e0.50
16	e0.00	e0.00	e0.00	e0.00	e0.00	e1.0	e0.75	e1.0	e5.0	e325	e0.25	e0.50
17	e0.00	e0.00	e0.00	e0.00	e0.00	e1.0	e0.75	e1.0	e5.0	e400	e0.25	e0.50
18	e0.00	e0.00	e0.00	e0.00	e0.00	e1.0	e0.75	e1.5	e5.0	e500	e0.25	e0.50
19	e0.00	e0.00	e0.00	e0.00	e0.00	e1.0	e0.75	e2.0	e2.0	e600	e0.25	e0.50
20	e0.00	e0.00	e0.00	e0.00	e0.00	e0.75	e0.75	e2.0	e2.0	e700	e0.25	e0.50
21	e0.00	e0.00	e0.00	e0.00	e0.00	e0.50	e0.75	e1.5	e2.0	e875	e0.25	e0.50
22	e0.00	e0.00	e0.00	e0.00	e0.00	e0.50	e0.75	e1.5	e5.0	e600	e0.25	e0.50
23	e0.00	e0.00	e0.00	e0.00	e0.00	e0.25	e0.75	e2.0	e5.0	e400	e0.25	e0.50
24	e0.00	e0.00	e0.00	e0.00	e0.00	e0.25	e0.75	e5.0	e10	e225	e0.25	e0.50
25	e0.00	e0.00	e0.00	e0.00	e0.00	e0.25	e0.75	e10	e10	e150	e0.25	e0.50
26	e0.00	e0.00	e0.00	e0.00	e0.00	e0.25	e1.0	e15	e10	e100	e0.25	e0.50
27	e0.00	e0.00	e0.00	e0.00	e0.00	e0.25	e1.0	e10	e10	e50	e0.25	e0.50
28	e0.00	e0.00	e0.00	e0.00	e0.00	e0.25	e1.0	e10	e10	e2.0	e0.25	e0.25
29	e0.00	e0.00	e0.00	e0.00	---	e0.25	e1.0	e10	e10	e1.0	e0.25	e0.25
30	e0.00	e0.00	e0.00	e0.00	---	e0.50	e1.0	e5.0	e5.0	e1.0	e0.50	e0.25
31	e0.00	---	e0.00	e0.00	---	e1.0	---	e5.0	---	e1.0	e0.50	---
TOTAL	0.00	0.00	0.00	0.00	0.00	12.25	24.75	98.5	123.0	5537.0	12.25	11.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.40	0.82	3.18	4.10	179	0.40	0.37
AC-FT	0	0	0	0	0	24	49	195	244	10980	24	22
MAX	0.00	0.00	0.00	0.00	0.00	1.0	1.0	15	10	875	1.0	0.50
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.75	1.0	1.0	1.0	0.25	0.25
CAL YR	2010	TOTAL	157.12	MEAN	0.43	MAX	3.1	MIN	0.00	AC-FT	312	
WTR YR	2011	TOTAL	5818.75	MEAN	15.9	MAX	875	MIN	0.00	AC-FT	11540	

MAX DISCH: (N/A. No gage height record is kept.)

MAX GH: 0.00 FT (N/A. No gage height record is kept.)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06763980 SOUTH PLATTE RIVER AT JULESBURG (LEFT CHAN. #4)
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06764000 SOUTH PLATTE RIVER AT JULESBURG (COMBINED)
Water Year 2011

Location.--	Lat 40°58'37", long 102°14'52", in NE 1/4 SE 1/4 sec. 33, T.12 N., R.44 W., on Highway 385 bridge south of Julesburg CO.
Drainage Area and Period of Record.--	23,821 mi ² . Apr. 1902 to present. Monthly discharge for some periods published in USGS WSP 1310.
Equipment.--	Combined record composed from records developed at Channel 1, 2, 4 and the Town of Julesburg effluent records. See individual records for descriptions of gage equipment.
Hydrologic Conditions.--	The South Platte River at Julesburg is a braided sand channel. Four channels can contain flow with a majority of the flow occurring in Channel 1. The river is gaged on Channels 1, 2, and 4, and a combined flow record is published for South Platte River at Julesburg (PLAJUCCO). Channels 1 and 2 split apart about 1/3 mile upstream from the gage and the proportion of water in Channel 1 has been increasing in recent years. At low flows, 90-100% of the flow is in Channel 1, with Channels 2 and 3 being dry and some local irrigation and storm runoff in Channel 4. Channel 2 and Channel 3 will have water only at high flows. Generally the river is dried by multiple diversions upstream. Julesburg flow is usually comprised of return flows or water passed to Nebraska to meet Compact requirements (April 1 - October 15, CRS: 37-65-101). However, during the winter, periods of higher flow can be seen as upstream supply is diverted less heavily and fewer dry up locations occur. Upstream diversions continue throughout the winter, except for periods of severe cold interrupting recharge and reservoir storage operations.
Gage-Height Record.--	See individual records for analyses of gage height record.
Datum Corrections.--	See individual station analyses.
Rating.--	See individual station analyses.
Discharge.--	<p>DAILY FLOWS: Combined daily flows are computed by inserting the mean daily flows for Channels 1, 2, 4, and Julesburg Effluent into a spreadsheet and adding the totals day-by-day. The spreadsheet was then used to generate the standard file of combined daily flows and the annual summary.</p> <p>PEAK DISCHARGE: Peak discharge occurs as a Combined Flow and this combined flow peak may or may not correspond to the peak discharges on the individual channel records. Finding the peak for the 15-minute data at a gage with multiple records requires a special procedure. Normally, the day of peak discharge can be determined from inspection of hydrograph. If flow is contained in Channel One, then the Channel One peak can be used. When flow is being recorded in multiple channels, 15-minute data peak is collated and discharges are entered on to a spreadsheet. The 15-minute peak is then determined by inspection. The peak is listed using Channel 1 GH, but without a shift. The above procedure was carried out in a spreadsheet and the peak flow was 7480 cfs at 0915 June 21, 2011 at a Channel 1 gage height of 8.74 ft.</p> <p>MAXIMUM GH: This is determined from Channel 1. Due to shift distributions, this may not be the Channel 1 GH corresponding to combined flow peak discharge. In 2011, the maximum Channel 1 GH occurred at 0815 July 21, 2011 with a value of 8.75 ft.</p> <p>ESTIMATED DAYS: If an estimate for either Channel 1, 2 or 4 contributes more than 10% of the total flow for a particular day, then the combined flow is considered estimated for that day. Estimated days for each channel are flagged in the combined flow calculation spreadsheet. Days with more than 10% of the total being estimates were determined by inspection. In 2011, the following days were determined to be estimated and poor: December 31, 2010-January 17, 2011, February 2-5, 8-12, 2011, June 3-7, 30-July 5, 13-19 and August 24-26, 2011.</p>
Special Computations.--	A number of special calculations may be needed each year. Spreadsheets are used to compute the combined flow record and flag estimated days.
Remarks.--	The majority of the combined flow is contributed from Channel 1. The record is rated as per Channel 1: "The record is good, except as follows: the ice affected periods of December 31, 2010-January 17, 2011, February 2-5 and 8-12, 2011, which are estimated and poor; June 3-7, June 30 - July 5, July 13-19, August 24-26, 2011, when instrument calibration was significantly impaired, the record is estimated and poor; August 27-September 3, 2011 when the instrument was not accurately tracking events, record is fair." except for July 6 and 20-23, 2011 which is rated fair. In the 2011 Water Year Channel 1 carried about 90% of the combined flow with 7% and 3% being carried in Channels 2 and 4 respectively. Record developed by Colorado Division of Water Resources staff.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06764000 SOUTH PLATTE RIVER AT JULESBURG (COMBINED)

RATING TABLE-- PLA JUL CO21 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

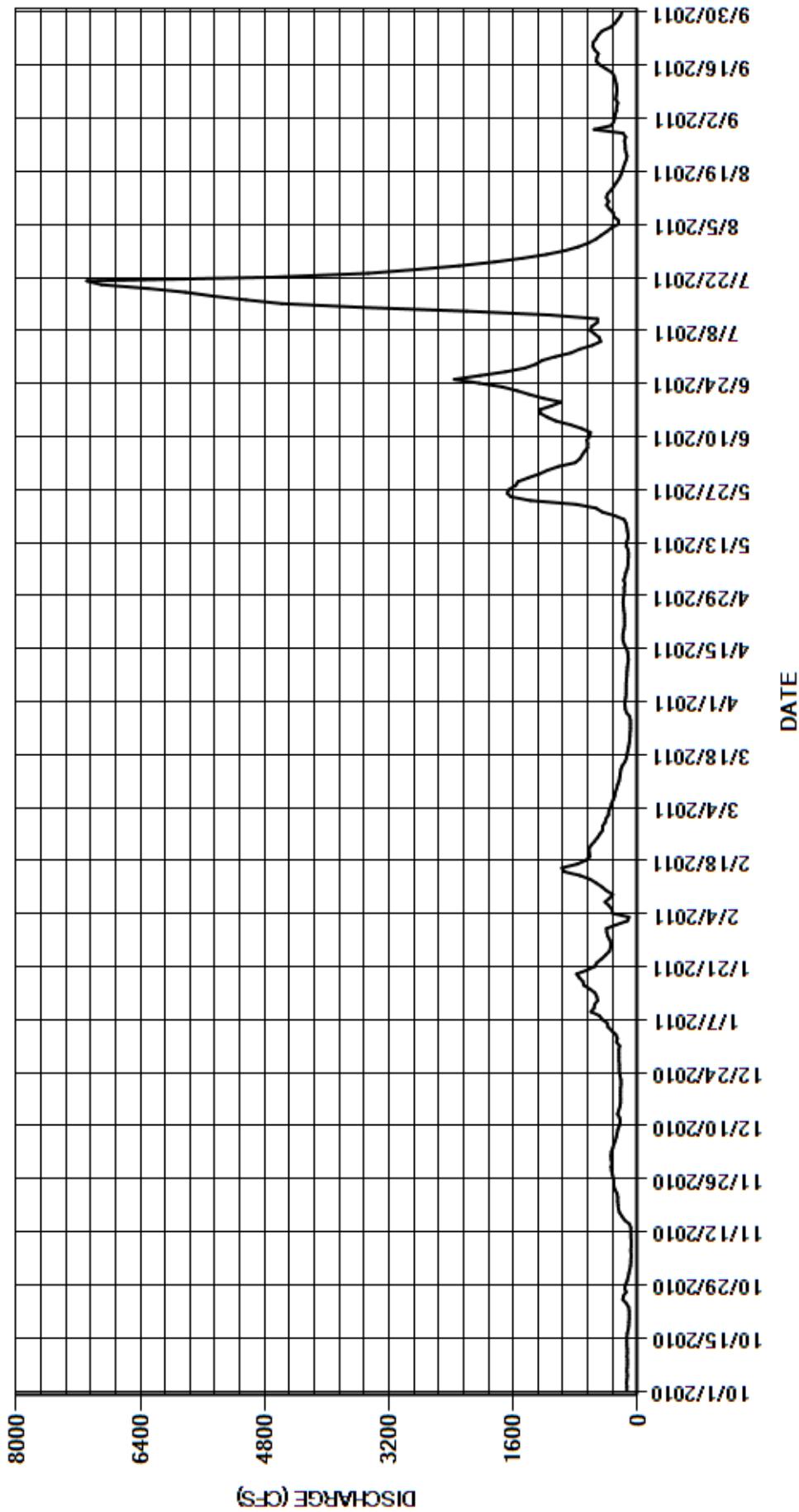
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	138	112	340	271	274	406	164	174	1160	1060	539	309
2	138	101	344	261	131	376	153	162	1020	856	472	294
3	142	91	338	280	111	371	149	179	804	745	400	288
4	137	88	321	331	321	349	146	161	746	582	338	271
5	133	85	305	381	331	336	146	153	714	477	247	269
6	137	84	287	391	366	314	147	133	683	492	248	256
7	136	87	273	455	419	295	142	125	643	553	305	282
8	131	84	263	492	361	286	139	124	642	613	314	274
9	132	84	254	601	321	270	136	120	654	589	363	267
10	137	85	235	561	401	257	132	119	616	520	399	268
11	133	85	223	552	460	238	126	122	606	516	374	275
12	135	86	231	514	531	230	119	148	718	1130	403	288
13	139	87	258	526	610	223	125	143	863	2200	386	300
14	141	106	242	549	743	216	127	125	1050	3530	341	327
15	138	168	229	612	942	197	147	123	1160	4580	304	406
16	135	201	220	691	975	164	171	132	1250	5040	272	483
17	122	234	218	704	777	145	188	139	1260	5470	238	531
18	115	248	223	749	669	136	189	149	1110	5820	216	524
19	112	251	221	786	614	126	187	175	986	6300	198	506
20	109	258	219	652	622	117	177	294	1210	6900	182	552
21	109	256	213	551	628	107	169	457	1390	7090	167	577
22	109	264	215	524	599	102	169	536	1550	4680	147	570
23	115	291	225	463	556	99	171	792	1740	3470	136	532
24	145	305	233	413	516	95	170	1380	2040	2850	151	504
25	190	306	235	363	485	93	178	1630	2360	2300	161	458
26	183	312	235	349	449	93	182	1680	2030	1840	161	348
27	148	324	240	343	453	93	188	1650	1700	1480	169	292
28	167	334	239	358	419	102	184	1570	1450	1170	154	256
29	155	342	239	385	---	143	179	1540	1310	935	187	220
30	134	330	242	397	---	159	171	1410	1230	762	560	204
31	122	---	231	402	---	163	---	1270	---	635	339	---
TOTAL	4217	5689	7791	14907	14084	6301	4771	16915	34695	75185	8871	10931
MEAN	136	190	251	481	503	203	159	546	1156	2425	286	364
AC-FT	8360	11280	15450	29570	27940	12500	9460	33550	68820	149100	17600	21680
MAX	190	342	344	786	975	406	189	1680	2360	7090	560	577
MIN	109	84	213	261	111	93	119	119	606	477	136	204
CAL YR	2010	TOTAL	297972	MEAN	816	MAX	9860	MIN	84	AC-FT	591000	
WTR YR	2011	TOTAL	204357	MEAN	560	MAX	7090	MIN	84	AC-FT	405300	

MAX DISCH: 7480 CFS AT 09:15 ON JUL 21,2011 GH 8.74 FT (Computed Peak)

MAX GH: 8.75 FT AT 08:15 ON JUL 21,2011 (Peak Stage from Channel 1 (ONEJURCO))

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06764000 SOUTHPLATTE RIVER AT JULESBURG (COMBINED)
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
STATELINE DITCH AUG. RETURN TO SOUTH PLATTE
Water Year 2011

Location.--	Lat 40°59'58", long 102°14'55", in NW1/4 NW1/4 of sec 27, T. 12N, R. 44W, Yuma County, East of Julesburg, Co. Gage is about 700 ft. north of US Highway 138 on Yuma County Road 43 near the Colorado-Nebraska Stateline.
Drainage Area and Period of Record.--	Not determined; Data from 2001 in DWR diversion records, published by Hydrographic Branch since 2007.
Equipment.--	Sutron SDR shaft encoder connected to a Sutron SatLink I Satellite Monitoring Data Collection Platform (DCP) in metal box enclosure and well section at a 4-foot Parshall flume. The flume is installed in a concrete canal section and is referenced with an outside staff. The high data rate DCP is mounted on poles next to the recorder enclosure.
Hydrologic Conditions.--	Controlled diversion from Julesburg Irrigation District Flow is derived from wells that pump directly into the ditch for delivery to the river as augmentation credit.
Gage-Height Record.--	The primary record is 15-minute SDR data. The record is complete and reliable, except for the following: The ditch turned off frequently, and many corrections were made to set the SDR to zero when the float was actually on mud and above zero datum. This was done by the ditch rider at the request of the water commissioner so that real time data was accurate. When live flow resumed, the GH was re-set to live flow by the ditch rider within an hour or two. Also, flows may have been present below the level where the float was beached, but these periods are considered zero for water rights administration purposes. (Credit is not given when record is not maintained.) These periods of zero flow were determined by observation and by inspection of the GH graphs. Many small GH calibrations were made during live flow that showed a + and – alternation, that is characteristic of plugged inlets, and were thus suspect. The corrections were not large enough to affect the accuracy of the record. To fully comply with record procedures, every time the GH was adjusted, a datum correction was used. This meant thirty-nine datum corrections were applied, using water commissioner visits and the SDR event log to guide the proration. The SDR event log was required for this since the Julesburg Irrigation District ditch rider did not record visit information when he set the recorder down to zero when the float was beached, and then corrected it back up when flow started. Corrections this year generally only applied to live flow for a few hours at each start-up time and did not adversely affect the record quality.
Datum Corrections.--	Levels run on Sept 1, 2010. No correction was required to the primary reference.
Rating.--	Control is a 4-foot steel Parshall Flume in earth channel. A standard 4- foot Parshall Flume rating was used again this year. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/- 5%) discharge measurement for a 4 ft Parshall Flume is 1.26 to 67.9 cfs. Anything above or below this range is outside the +/- 5% accuracy range. There were three days with many hourly flows outside the range in WY 2011, they are Oct 28-29, 2010 and Apr 18, 2011. Four measurements were made during the year ranging in discharge from 10.7 to 18.4 cfs. The peak flow of 25.7 cfs occurred at 1400 March 21, 2011 at a gage height of 1.44 ft with a shift of -0.09 ft. The peak was within the accurate measurement range of the flume.
Discharge.--	Shifting control method was used. Shifts were distributed by time proration with consideration to approach conditions changing. Shifts are caused by flume geometry and approach conditions. Measurement 5 had a shift of -0.06 ft and was held until the irrigation season was done in 2010. Measurement 6 had a shift of -0.09 ft was used to start the 2011 irrigation season and was held until the ditch was dug out around Jul 15, 2011. After the ditch was dug out measurements 7 and 8 were used using a shift of -0.02. The shifts for measurements 8, 9, and 10 were distributed by time proration. All measurements were given full weight except measurement 7 which was adjusted 1.66%. Measurement 7 and 8 were made on the same day.
Special Computations.--	Many periods of zero flow were computed as zero using the rating, bad (mud) GH's, and datum corrections derived from the SDR log.
Remarks.--	The record is considered good except for the following days are estimated and poor due to being outside the range of accuracy for a Parshall flume: October 28-29, 2010, and April 18, 2011. April 15, 2011 is estimated and poor due to unreliable GH's. Many hours of record were considered zero for purposes of water rights administration because mud in the stilling well prevented readings. Station maintained and record developed by Devin Ridnour
Recommendations.--	A number of things need to be done to bring this record up to publication standards. When the GH is adjusted during periods of live flow, a rod should be run through the inlet first to verify that the inlets do not have mud in them . The well needs to be inspected often to verify floats are not beaching at gage heights greater than zero. The ditch-rider needs to write on the paper visit sheet to be kept at the gage to record visits and adjustments made. If measurements are made by State of Nebraska personnel, a copy of the measurement should be obtained and recorded.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

STATELINE DITCH AUG. RETURN TO SOUTH PLATTE

RATING TABLE.-- STD04FTP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

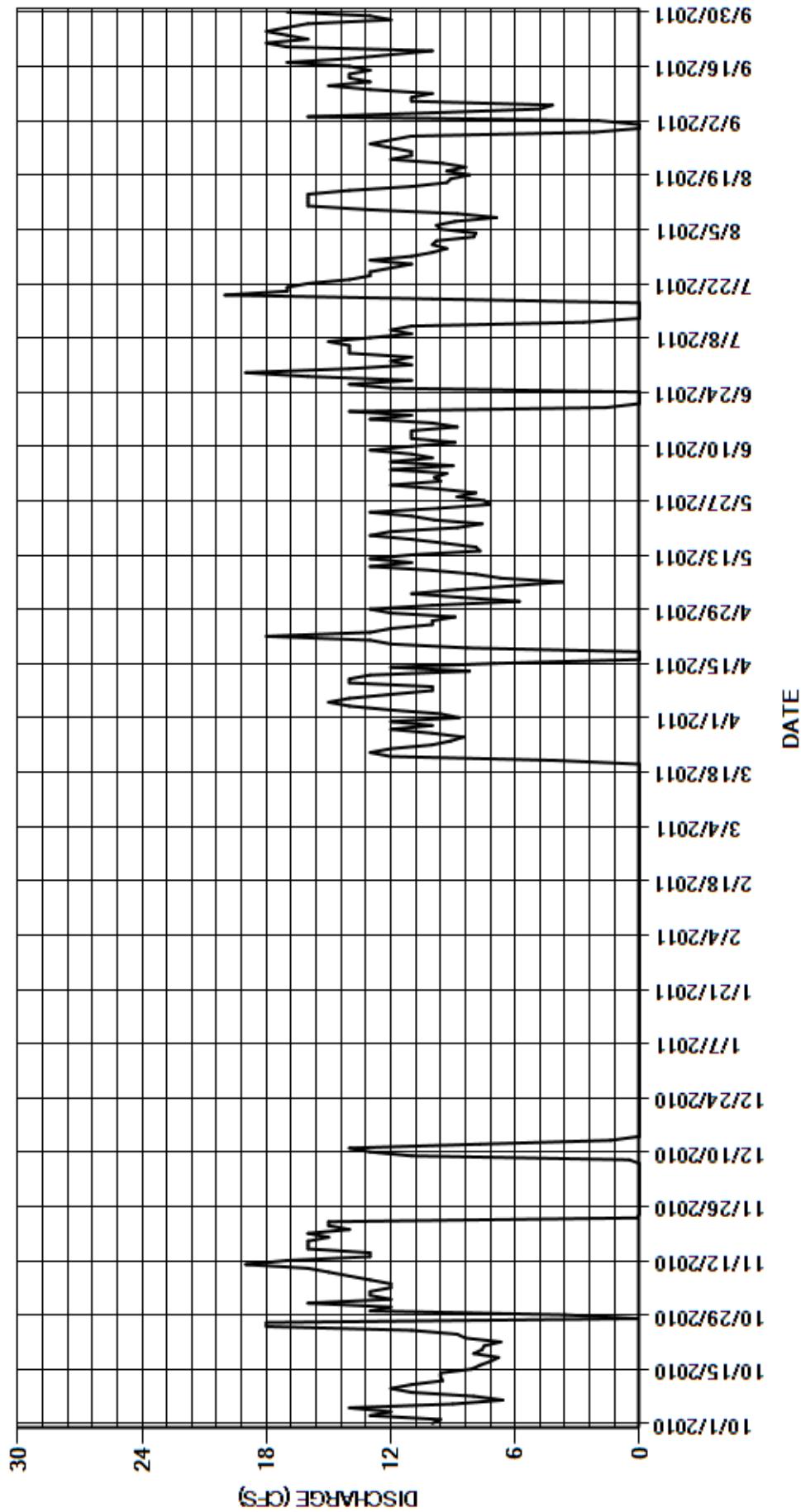
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10	16	0.00	0.00	0.00	0.00	8.7	5.8	9.6	11	10	0.00
2	9.6	12	0.00	0.00	0.00	0.00	9.6	8.6	9.9	12	9.8	2.0
3	13	13	0.00	0.00	0.00	0.00	12	11	9.3	11	8.0	16
4	12	13	0.00	0.00	0.00	0.00	14	8.8	12	14	7.9	10
5	14	12	0.00	0.00	0.00	0.00	15	6.2	9.0	14	9.6	4.8
6	9.0	12	0.00	0.00	0.00	0.00	14	3.7	12	14	9.8	4.2
7	6.6	13	0.00	0.00	0.00	0.00	12	6.7	10	15	8.9	11
8	8.0	14	0.50	0.00	0.00	0.00	10	7.9	11	13	6.9	11
9	11	15	11	0.00	0.00	0.00	10	10	13	11	8.8	10
10	12	16	13	0.00	0.00	0.00	14	13	11	12	13	13
11	11	19	14	0.00	0.00	0.00	14	11	8.9	11	16	15
12	9.5	17	7.7	0.00	0.00	0.00	13	13	11	2.7	16	13
13	9.6	13	1.4	0.00	0.00	0.00	8.2	11	11	0.00	16	14
14	9.6	13	0.00	0.00	0.00	0.00	12	7.7	11	0.00	16	14
15	8.1	16	0.00	0.00	0.00	0.00	67.0	7.9	8.8	0.00	14	13
16	7.7	16	0.00	0.00	0.00	0.00	0.00	9.4	10	0.00	11	14
17	7.2	16	0.00	0.00	0.00	0.00	0.00	11	13	0.00	9.3	17
18	6.8	15	0.00	0.00	0.00	0.00	0.00	13	11	10	9.1	14
19	8.0	16	0.00	0.00	0.00	0.00	8.3	12	14	20	8.2	12
20	7.6	14	0.00	0.00	0.00	0.00	12	8.8	1.6	17	9.3	10
21	7.5	15	0.00	0.00	0.00	4.1	13	7.6	0.00	17	8.4	17
22	6.7	15	0.00	0.00	0.00	12	18	9.9	0.00	16	9.5	18
23	8.4	0.12	0.00	0.00	0.00	13	13	11	0.00	14	12	16
24	8.8	0.00	0.00	0.00	0.00	12	12	13	0.00	13	11	17
25	11	0.00	0.00	0.00	0.00	10	10	9.7	12	13	11	18
26	18	0.00	0.00	0.00	0.00	9.1	10	7.2	14	12	12	17
27	18	0.00	0.00	0.00	0.00	8.5	8.9	7.5	11	11	13	16
28	0.11	0.00	0.00	0.00	0.00	10	12	8.8	16	13	12	12
29	3.6	0.00	0.00	0.00	---	12	13	7.9	19	11	11	13
30	13	0.00	0.00	0.00	---	10	10	9.7	14	10	2.2	17
31	12	---	0.00	0.00	---	12	---	12	---	9.3	0.00	---
TOTAL	297.41	321.12	47.60	0.00	0.00	112.70	313.70	290.8	293.10	327.00	319.70	379.00
MEAN	9.59	10.7	1.54	0.000	0.000	3.64	10.5	9.38	9.77	10.5	10.3	12.6
AC-FT	590	637	94	0	0	224	622	577	581	649	634	752
MAX	18	19	14	0.00	0.00	13	18	13	19	20	16	18
MIN	0.11	0.00	0.00	0.00	0.00	0.00	0.00	3.7	0.00	0.00	0.00	0.00
CAL YR	2010	TOTAL	2475.05	MEAN	6.78	MAX	20	MIN	0.00	AC-FT	4910	
WTR YR	2011	TOTAL	2702.13	MEAN	7.40	MAX	20	MIN	0.00	AC-FT	5360	

MAX DISCH: 25.7 CFS AT 14:00 ON MAR 21,2011 GH 1.44 FT SHIFT -0.09 FT

MAX GH: 1.44 FT AT 14:00 ON MAR 21,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

STATELINE DITCH AUG. RETURN TO SOUTHPLATTE
WY2011 HYDROGRAPH



TRANSMOUNTAIN DIVERSIONS INTO THE SOUTH PLATTE BASIN IN COLORADO, WY 2011 WATER YEAR 2011 (October 2010 - September 2011)

FROM THE COLORADO RIVER BASIN

TOTALS FROM THE COLORADO RIVER BASIN (DAY-CFS)

200,615

TOTALS FROM THE COLORADO RIVER BASIN (ACRE-FT))

397,920

*West slope water only

****Direct release to Clear Creek only. All other flow included in Moffat Tunnel**

FROM THE LARAMIE RIVER BASIN

TOTALS FOR THE LARAMIE RIVER (DAY-CFS) WY2010

WY2010

8,388

TOTALS FOR THE LARAMIE RIVER (AF, 19875 AF per CALENDAR Year Allowed Under Laramie River Agreement) WY2011

16,638

TOTALS FOR THE LARAMIE RIVER (AF, 19875 AF per CALENDAR Year Allowed Under Laramie River Agreement) CY2011

16,638

	2010			2011			APR	MAY	JUN	JUL	AUG	SEP	TOTAL
	OCT	NOV	DEC	JAN	FEB	MAR							
Wilson Supply Ditch (Gage)	0	0	0	0	0	0	0	93.3	1045	210	5.02	0	1,353
minus Deadman Ditch	0	0	0	0	0	0	0	0	316	206	4.88	0	527
= SAND CR. DIVERSION***	0	0	0	0	0	0	0	93.3	729	4.00	0.14	0	826

*** Negative Numbers due to Deadman Ditch Losses

TOTALS FROM THE LARAMIE RIVER BASIN (DAY-CFS)

9,215

TOTALS FROM THE LARAMIE RIVER BASIN (ACRE-FT) 18 278

FROM THE NORTH PLATTE RIVER BASIN

SPECIAL CATEGORIES

NAME	2010			2011									TOTAL
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	
Hoosier Pass Tunnel *	592	414	0	0	0	0	0	148	362	65.0	0	0	1,581
Aurora Homestake Pipeline**	2054	2248	2317	2315	2092	2319	0	0	0	1917	2396	0	17,658

* Diverts into Division One, but entire flow is piped to the City of Colorado Springs in Division 2.

Diverts into Division One, but entire flow is piped to the City of Colorado Springs in Division 2
** Contains a Mixture of Colorado River Water, and Water Transferred from the Arkansas River

PLATTE RIVER BASIN
AURORA HOMESTAKE PIPELINE TO SPINNEY RESERVOIR
Water Year 2011

Location.--	Lat. N38° 54' 54.54", Long. W105° 41'03.34" (NAD83) spotted from Google Earth)). Flow meters in a vaulted turnout off the Homestake Pipeline approximately 5.25 mi. SW of the Spinney Mountain Reservoir Dam, in Park County, CO.
Drainage Area and Period of Record.--	The "Spinney Tap" is Aurora's delivery component of the Homestake pipeline project; delivering transbasin water to Spinney Mountain Reservoir. Daily values are available from October 1, 1998 to present.
Equipment.--	Two 30 inch Venturi meters off the Homestake Pipeline upstream of two sleeve type (Bailey) control valves with open discharge. One is the main discharge valve to Spinney Mountain Reservoir (Discharge No. 1) and the other (Discharge No. 2) serves as a pressure-relief valve for the pipeline. Both meters are monitored by a Sutron SatLink Data Collection Platform (DCP) and by Aurora and the City of Colorado Spring's Supervisory Control and Data Acquisition (SCADA) system. The Venturi meters, DCP, SCADA system and facilities are owned and maintained by the City of Aurora.
Hydrologic Conditions.--	Flow is comprised of transmountain water imported from a number of sources in the Colorado River Basin, Colorado River water stored on the Eastern slope from previous years, and native Arkansas River water transferred from points downstream. All flow is diverted to Twin Lakes Reservoir and transported in the Homestake pipeline to the Otero Pump Station. The pipeline delivers water to Aurora at Spinney Mountain Reservoir and continues to the City of Colorado Spring's Rampart Reservoir. Colorado River water is included in deliveries of Homestake Tunnel, Busk-Ivanhoe Tunnel and Twin-Lakes Tunnel. In general the total flow at this gage represents approximately 45% Colorado River Water, and 55% Arkansas basin water. Water deliveries are ordered to Spinney Reservoir through the main discharge (Discharge No.1). Spikes of water from the pressure relief valve (Discharge No. 2) are usually small and infrequent. Water delivered into Spinney through the relief valve is accidental and can occur when water is not delivered through the main discharge valve.
Gage-Height Record.--	The primary record is hourly discharge values recorded by the DCP from the two Venturi meters. The record is complete and reliable.
Datum Corrections.--	Not applicable.
Rating.--	A differential pressure versus rate of flow rating is used to convert inches of head to flow in cfs. The rating is provided by Primary Flow Signal, the Venturi meter manufacturer. The differential pressure transmitter on the Venturi meters was last calibrated by the City of Aurora Instrumentation division on June 30, 2011. The transmitters were found to be in tolerances and no adjustments were made. A mass balance spreadsheet is routinely used by Otero Pump Station personnel to check discharge at the Spinney Tap. Two measurements (Nos. 1-2) were made this year, ranging in discharge from 75.0 to 75.7 cfs. Both measurements correlated within 1% of the differential pressure versus rate of flow rating provided by the manufacture and were within 1% of the reported DCP and SCADA discharge values. The peak discharge of 121cfs was recorded at 2200 hours on December 1, 2010 and was the combined flow from both Discharge 1 and Discharge 2. The peak exceeded measurement No. 2 made on March 3, 2011 by 45.3 cfs.
Discharge.--	Discharge is directly collected from the two venturi meters and reported to the DCP.
Special Computations.--	The two primary record parameters (Discharge 1 and Discharge 2) were loaded into a spreadsheet adjusted from GMT to local time and combined to provide total hourly discharge. This record was compared to SCADA values reported by the Otero Pump Station graphically and tabularly. The records compared well. Hourly discharge values were then averaged to provide average daily discharge values. The record presented herein is the daily average total discharge of the two valves.
Remarks.--	During the production of the record a programming error was revealed which had changed the DCP's setup from 15-minute intervals to 1-hour intervals which may have resulted in loss of resolution in discharge values recorded by the DCP, especially those flows occurring through the relief valve since those flows are transient in nature. The record is regarded as fair as a result of the loss of resolution. Record developed by Russell Stroud and Mike Wild.
Recommendations.--	Open channel measurements will continue to be sporadically performed to validate meter readings as time allows. A Sutron Monitor 1 data logger was installed and will be used for back up to the DCP for data recorded after November 23, 2011 when the installation and programming was finalized.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

AURORA HOMESTAKE PIPELINE TO SPINNEY RESERVOIR

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

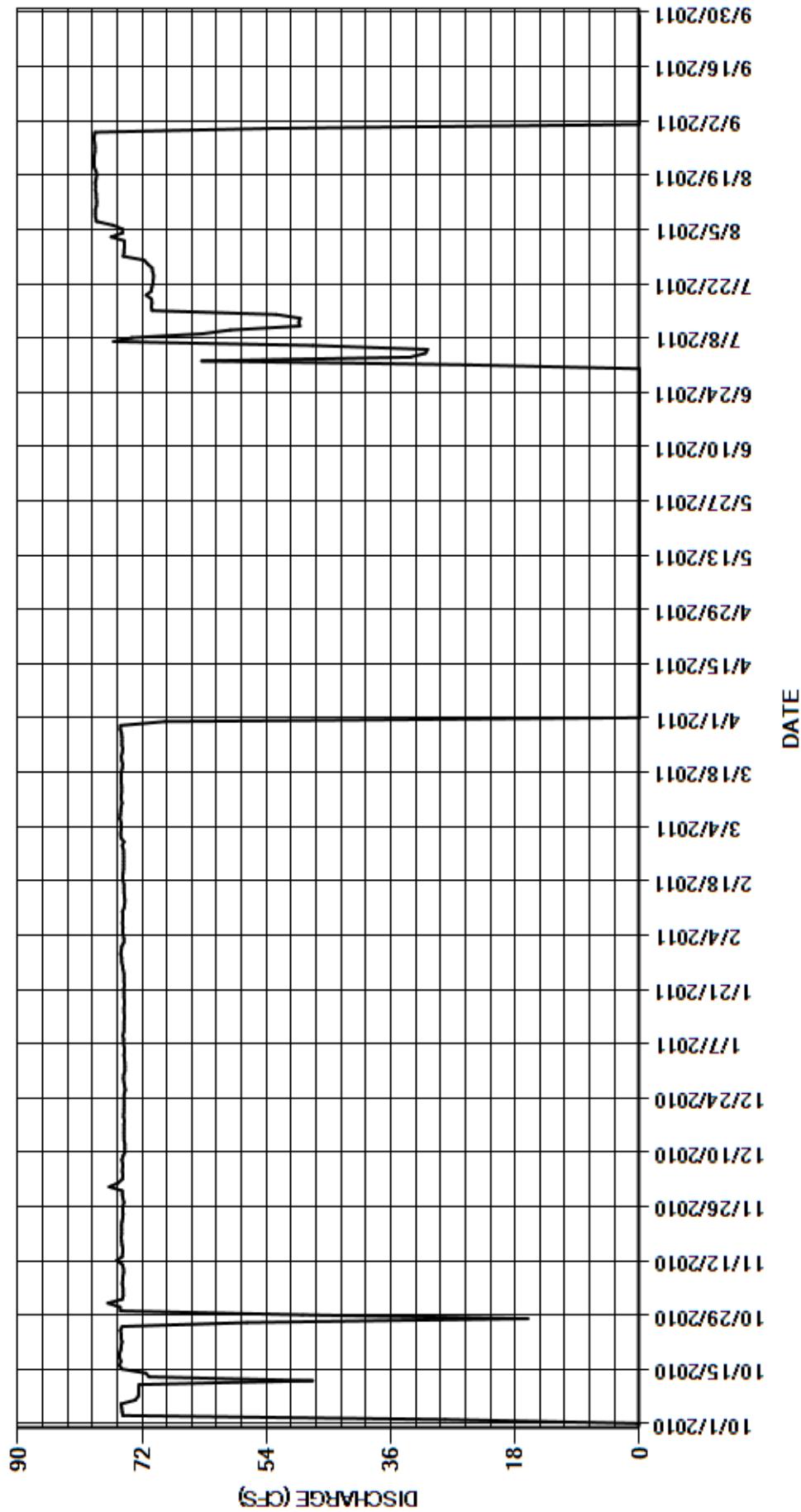
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	77	77	74	75	75	0.00	0.00	0.00	25	75	0.00
2	28	75	75	75	75	75	0.00	0.00	0.00	63	75	0.00
3	75	75	75	75	75	75	0.00	0.00	0.00	33	76	0.00
4	75	75	75	75	75	75	0.00	0.00	0.00	31	75	0.00
5	75	75	75	75	75	75	0.00	0.00	0.00	31	75	0.00
6	75	75	75	75	75	75	0.00	0.00	0.00	47	76	0.00
7	73	75	75	75	75	75	0.00	0.00	0.00	76	79	0.00
8	73	75	75	75	75	75	0.00	0.00	0.00	73	79	0.00
9	72	75	75	75	75	75	0.00	0.00	0.00	63	79	0.00
10	73	75	74	75	75	75	0.00	0.00	0.00	59	79	0.00
11	72	75	75	75	75	75	0.00	0.00	0.00	49	79	0.00
12	47	76	74	75	75	75	0.00	0.00	0.00	49	79	0.00
13	71	75	75	75	75	75	0.00	0.00	0.00	49	79	0.00
14	72	75	75	75	75	75	0.00	0.00	0.00	53	79	0.00
15	75	75	75	75	75	75	0.00	0.00	0.00	71	79	0.00
16	75	75	75	75	75	75	0.00	0.00	0.00	71	79	0.00
17	75	75	75	75	75	75	0.00	0.00	0.00	71	79	0.00
18	75	75	75	75	75	75	0.00	0.00	0.00	71	79	0.00
19	75	75	75	75	75	75	0.00	0.00	0.00	71	79	0.00
20	75	75	75	75	75	75	0.00	0.00	0.00	71	79	0.00
21	75	75	75	75	75	75	0.00	0.00	0.00	71	79	0.00
22	75	75	75	75	75	75	0.00	0.00	0.00	70	79	0.00
23	75	75	75	75	75	75	0.00	0.00	0.00	70	79	0.00
24	75	75	75	75	75	75	0.00	0.00	0.00	70	79	0.00
25	75	75	75	75	75	75	0.00	0.00	0.00	70	79	0.00
26	75	75	74	75	75	75	0.00	0.00	0.00	71	79	0.00
27	57	75	75	75	75	75	0.00	0.00	0.00	71	79	0.00
28	16	75	75	75	75	75	0.00	0.00	0.00	72	79	0.00
29	49	75	75	75	---	75	0.00	0.00	0.00	75	79	0.00
30	75	75	75	75	---	75	0.00	0.00	0.00	75	79	---
31	75	---	74	75	---	69	---	0.00	---	75	53	---
TOTAL	2053.00	2253	2323	2324	2100	2319	0.00	0.00	0.00	1917	2401	0.00
MEAN	66.2	75.1	74.9	75.0	75.0	74.8	0.000	0.000	0.000	61.8	77.5	0.000
AC-FT	4070	4470	4610	4610	4170	4600	0	0	0	3800	4760	0
MAX	75	77	77	75	75	75	0.00	0.00	0.00	76	79	0.00
MIN	0.00	75	74	74	75	69	0.00	0.00	0.00	25	53	0.00
CAL YR	2010	TOTAL	15119.00	MEAN	41.4	MAX	78	MIN	0.00	AC-FT	29990	
WTR YR	2011	TOTAL	17690.00	MEAN	48.6	MAX	79	MIN	0.00	AC-FT	35090	

MAX DISCH: 121 CFS AT 22:00 ON DEC 01,2010 (Computed record)

MAX GH: 0.00 FT (Combined record from two Venturi meters)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

AURORA HOMESTAKE PIPELINE TO SPINNEY RESERVOIR
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
HOOSIER PASS TUNNEL AT MONTGOMERY RESERVOIR NEAR ALMA
Water Year 2011

Location.--	Lat. N39° 21' 36.39", Long. W106° 04' 39.15" (Spotted from Google Earth (NAD83)). Gage is located in a tunnel at the downstream end of Hoosier Pass Tunnel at Montgomery Reservoir 5.3 miles north of Alma, CO.
Drainage Area and Period of Record.--	Transmountain diversion diverting waters from tributaries of the Blue River in the Colorado River Basin to Montgomery Reservoir on the Middle fork of the South Platte River in the South Platte River Basin. Daily values are available from the DWR from 1952 to present.
Equipment.--	Digital incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink 2 Data Collection Platform (DCP) transmitting hourly and a Sutron SDR-0001-1 (City of Colorado Springs) at an 8-ft. Parshall Flume set in concrete located inside the tunnel. A reference point and metal drop tape are the primary reference with a supplemental staff gage located on the left wing wall of the flume at the Ha location. Facilities are owned and maintained by the City of Colorado Springs. Satellite equipment is owned and maintained by DWR staff.
Hydrologic Conditions.--	Transmountain diversion operating seasonally. Flows are intercepted from Blue River Headwaters and will follow a diurnal pattern as snowpack melts. Diversion can be called out (shut off) by senior water rights on the Blue River and further downstream. The flow is controlled by numerous diversions into the tunnel inlet from the Blue River drainage. Montgomery Reservoir was drained during the 2011 water year for maintenance resulting in smaller than normal diversions through the tunnel.
Gage-Height Record.--	The primary record is 15-minute satellite data with logged 15-minute DCP and SDR data as backup. The record is complete and reliable. Gage heights of 0.09 ft. and less were considered non-operational flow. The following days with GH less than 0.09 ft were adjusted to zero for the record: October 1-3, 2010; April 6 to May 4, 2011; June 28 to July 11, 2011 and July 14 to September 30, 2011. 15- minute data were adjusted to zero as it was less than or equal to 0.09 ft. of stage of the following day: October 4; May 5; June 27 and July 12-13, 2011. Instrument calibration was insured by fifteen visits. Logged SDR data agreed with telemetered data within ±0.02 ft.
Datum Corrections.--	Levels were last run on October 12, 2011 using the flume crest as base. The gage was found to be within allowable tolerances. The left side of the Parshall flume was found to be 0.02 ft higher than the right side which is consistent with past results.
Rating.--	The control is an 8-ft. Parshall flume. A standard 8-ft. Parshall rating, STD08FTP, was continued for all of WY2011. Three measurements (Nos. 141-143) were made during the 2011 water year, ranging in discharge from 5.71 to 20.6 cfs. Measurements Nos. 141-143 and one observation of no flow cover the range in stage experienced this year. The peak flow of 79.4 cfs occurred at 0215 on July 13, 2011 at a gage-height of 1.76 ft. using a shift of 0.00 ft. It exceeded high flow Measurement No. 141, made October 27, 2010 by 1.01 ft. of stage and 58.8 cfs.
Discharge.--	Per agreement with the City of Colorado Springs measurements within 5% of the rating are adjusted to the rating. As such, Measurements No. 141 (made in WY2011) and No. 144 (Made in WY2012) were adjusted 1.5% and 1.0% respectively to the rating. The rating was directly applied to the gage-height record to compute discharge. Get-away conditions are good and submergence of the control is not a problem. Since the flume is in the tunnel, moss and algae are generally not a factor. Rust and corrosion in the flume as well as deformities in the vertical walls of the flume, may lead to permanent shifting conditions. A stage-shift relationship was recognized for gage-height of 1.20 ft. and higher in WY2010. However, the number of confirming measurements in this "upper stage range" does not support use of a stage-shift curve at this time.
Special Computations.--	Zero flow is determined operationally. Gage-heights of 0.09 ft. and less represent zero flow. Active diversions were not occurring on days when the shaft encoder recorded these stages. Zero flow was determined to be occurring on part of the day or all day on the following days: October 1-3, 2010, April 6-May 5 and June 27-September 30, 2011.
Remarks.--	The record is good. Station maintained and record developed by Michael Wild.
Recommendations.--	Flume shows significant corrosion and should be inspected for possible repairs to restore the surface and possibly address levelness issues across the flume's crest. Levels should be run again in WY2012. Continued opportunities to perform discharge measurements at gage-heights of 1.20 ft. above should be watched for.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

HOOSIER PASS TUNNEL AT MONTGOMERY RESERVOIR NEAR ALMA

RATING TABLE-- STD08FTP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

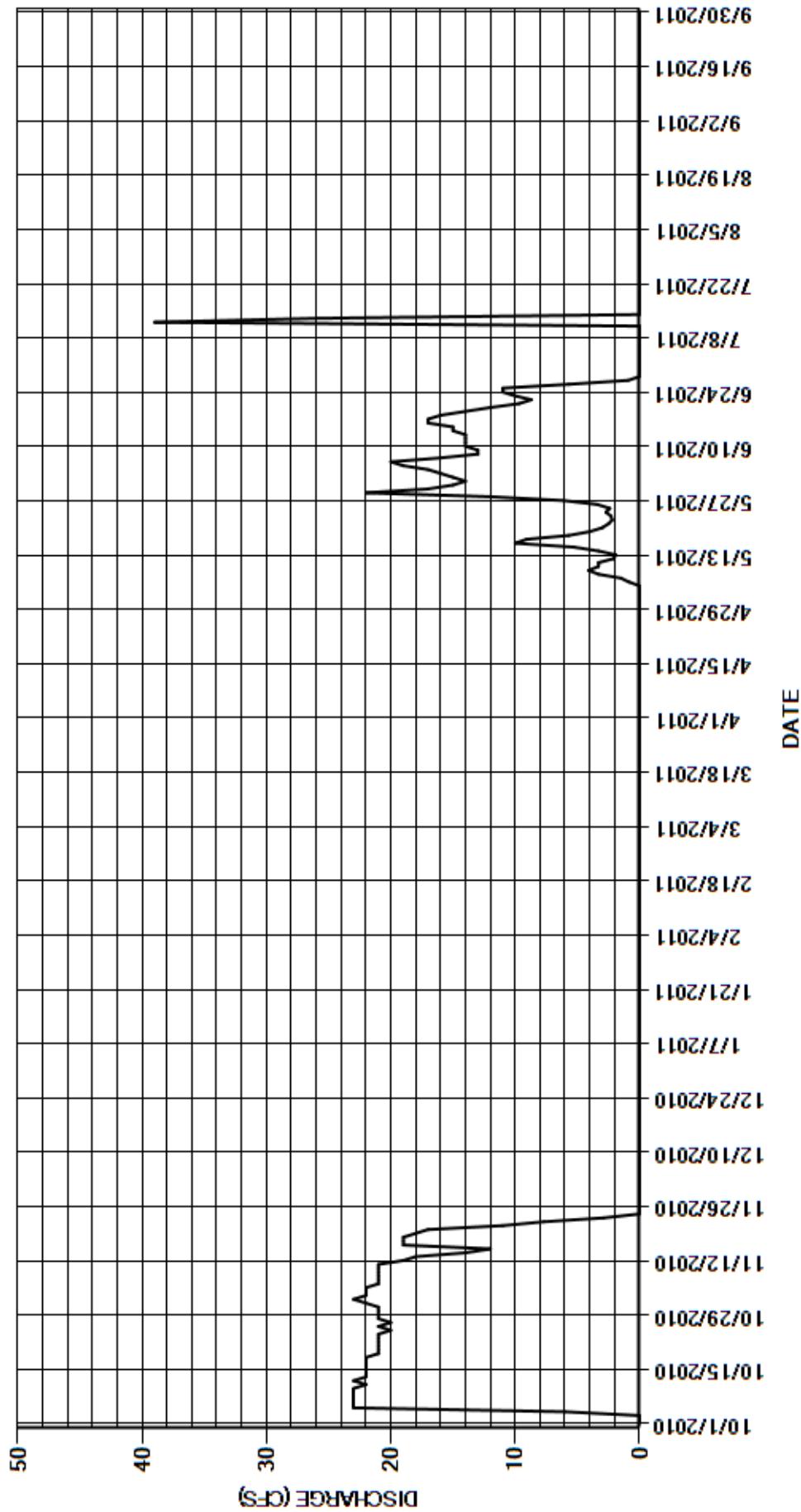
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	22	0.00	0.00	0.00	0.00	0.00	0.00	14	0.00	0.00	0.00
2	0.00	23	0.00	0.00	0.00	0.00	0.00	0.00	15	0.00	0.00	0.00
3	0.00	22	0.00	0.00	0.00	0.00	0.00	0.00	16	0.00	0.00	0.00
4	6.0	22	0.00	0.00	0.00	0.00	0.00	0.00	17	0.00	0.00	0.00
5	23	22	0.00	0.00	0.00	0.00	0.00	0.00	19	0.00	0.00	0.00
6	23	21	0.00	0.00	0.00	0.00	0.00	0.84	20	0.00	0.00	0.00
7	23	21	0.00	0.00	0.00	0.00	0.00	1.5	16	0.00	0.00	0.00
8	23	21	0.00	0.00	0.00	0.00	0.00	3.3	13	0.00	0.00	0.00
9	23	21	0.00	0.00	0.00	0.00	0.00	4.1	13	0.00	0.00	0.00
10	23	21	0.00	0.00	0.00	0.00	0.00	3.3	14	0.00	0.00	0.00
11	22	21	0.00	0.00	0.00	0.00	0.00	3.3	14	0.00	0.00	0.00
12	23	19	0.00	0.00	0.00	0.00	0.00	2.1	14	39	0.00	0.00
13	22	18	0.00	0.00	0.00	0.00	0.00	1.9	14	26	0.00	0.00
14	22	14	0.00	0.00	0.00	0.00	0.00	3.3	15	0.00	0.00	0.00
15	22	12	0.00	0.00	0.00	0.00	0.00	5.3	15	0.00	0.00	0.00
16	22	19	0.00	0.00	0.00	0.00	0.00	10	17	0.00	0.00	0.00
17	22	19	0.00	0.00	0.00	0.00	0.00	9.1	17	0.00	0.00	0.00
18	22	19	0.00	0.00	0.00	0.00	0.00	5.7	16	0.00	0.00	0.00
19	21	18	0.00	0.00	0.00	0.00	0.00	4.0	14	0.00	0.00	0.00
20	21	17	0.00	0.00	0.00	0.00	0.00	3.0	12	0.00	0.00	0.00
21	21	11	0.00	0.00	0.00	0.00	0.00	2.5	9.7	0.00	0.00	0.00
22	21	7.7	0.00	0.00	0.00	0.00	0.00	2.2	8.7	0.00	0.00	0.00
23	21	2.9	0.00	0.00	0.00	0.00	0.00	2.3	10	0.00	0.00	0.00
24	21	0.00	0.00	0.00	0.00	0.00	0.00	2.7	11	0.00	0.00	0.00
25	20	0.00	0.00	0.00	0.00	0.00	0.00	2.4	11	0.00	0.00	0.00
26	21	0.00	0.00	0.00	0.00	0.00	0.00	3.4	5.7	0.00	0.00	0.00
27	20	0.00	0.00	0.00	0.00	0.00	0.00	6.1	0.91	0.00	0.00	0.00
28	21	0.00	0.00	0.00	0.00	0.00	0.00	12	0.00	0.00	0.00	0.00
29	21	0.00	0.00	0.00	---	0.00	0.00	22	0.00	0.00	0.00	0.00
30	21	0.00	0.00	0.00	---	0.00	0.00	17	0.00	0.00	0.00	0.00
31	21	---	0.00	0.00	---	0.00	---	15	---	0.00	0.00	---
TOTAL	592.00	413.60	0.00	0.00	0.00	0.00	0.00	148.34	362.01	65.00	0.00	0.00
MEAN	19.1	13.8	0.000	0.000	0.000	0.000	0.000	4.79	12.1	2.10	0.000	0.000
AC-FT	1170	820	0	0	0	0	0	294	718	129	0	0
MAX	23	23	0.00	0.00	0.00	0.00	0.00	22	20	39	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAL YR	2010	TOTAL	5088.33	MEAN	13.9	MAX	185	MIN	0.00	AC-FT	10090	
WTR YR	2011	TOTAL	1580.95	MEAN	4.33	MAX	39	MIN	0.00	AC-FT	3140	

MAX DISCH: 79.4 CFS AT 02:15 ON JUL 13,2011 GH 1.76 FT SHIFT 0 FT

MAX GH: 1.76 FT AT 02:15 ON JUL 13,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

HOOSIER PASS TUNNEL AT MONTGOMERY RESERVOIR NEAR ALMA
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
09046000 BOREAS PASS DITCH AT BOREAS PASS
Water Year 2011

Location.--	Lat. N39° 24' 38.36", Long. W105° 58' 5.02" (NAD83) spotted from Google Earth). 1.50-ft. Parshall Flume in an underground tunnel near the summit of Boreas Pass.
Drainage Area and Period of Record.--	Transmountain diversion diverting water from the headwaters of Indiana Creek in the Colorado River Basin to Tarryall Creek in the South Platte River Basin. Daily values are available from the DWR from October 1, 1932 to September 30, 1940 and from October 1, 1950 to present.
Equipment.--	Digital incremental Sutron SDR-0001-1 shaft encoder connected to a Sutron SatLink 2 Data Collection Platform (DCP) transmitting hourly at a 1.5-ft. Parshall Flume. A second Sutron SDR-0001-1 incremental shaft encoder is co-located and serves as backup to the primary encoder. The ditch goes underground after collection, and the flume and equipment are housed inside a manhole. The flume is set into the concrete pipeline, approximately 14 ft. underground. A staff gage in the flume is used as the primary reference gage. The gage and equipment are owned by the City of Englewood. The DCP and ditch gates are operated by an independent contractor under a contract arrangement with Englewood.
Hydrologic Conditions.--	Boreas Pass Ditch is a transmountain diversion diverting water from the headwaters of Indiana Creek to Tarryall Creek. The collection area is alpine tundra and talus slopes above timberline.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data and 15-minute logged SDR data as backup. The gage was operated and satellite data were collected from June 17 to August 30, 2011. The record for the period of operation is complete and reliable. Six visits were made during the period of operation ensuring instrument calibration. The primary and backup records agree within 0.02 ft. The days with partial data on start up and shut down of satellite equipment were hand entered into the record (zero flow days).
Datum Corrections.--	No levels have been run and no datum corrections were used for the record. The flume was installed in 1992, and appears to be level laterally, with all measurements this year showing consistent depths at all verticals. However, investigation with a hand level shows a slight increase in elevation longitudinally towards the downstream end of the flume.
Rating.--	The control is a 1.5 foot Parshall flume. Rating STD01HFTP was continued this year. It is a standard Parshall flume rating throughout the entire range. Two discharge measurements (No. 30, 31) were made this year returning discharge rates of 3.77 and 1.74 cfs respectively. This year's measurements and two observations of zero flow cover the range in stage experienced this year. The peak flow of 4.5 cfs occurred at 1800 on July 7, 2011 at a gage-height of 0.87 feet with a shift of -0.04 ft. It exceeded Measurement No. 30 by 0.73 cfs and 0.08 ft. of stage.
Discharge.--	Shifting control method was used for all periods of record. Negative shifting is most likely caused by the flume being out of level longitudinally and by increased roughness caused by the presence of concrete residue steaming from the flume's installation. Open water measurements showed raw shifts of -0.05 ft and -0.04 ft respectively. Measurement No. 30 was adjusted -2% to match historic shifting patterns.
Special Computations.--	Point of zero flow (PZF) has been observed at a gage height of 0.09 ft. This indicates the height of the intake above the flume floor which traps water in the stilling well. Gage heights less than 0.09 ft (PZF) were adjusted to zero occurring on August 30, 2011 when the headgate was turned out and to equipment shut down.
Remarks.--	The record is good. The gage is seasonal and runs typically from May or June to August. The permanent nature of the flume installation suggests that some permanent level of shift is built into the flume. Station maintained and record developed by Mike Wild.
Recommendations.--	Flume condition should be checked for roughness and possible remediation.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09046000 BOREAS PASS DITCH AT BOREAS PASS

RATING TABLE.-- STD01HFTPf USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	1.2	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.9	1.2	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	1.1	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.7	1.1	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.6	1.0	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.6	0.96	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.7	0.91	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.9	0.86	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.9	0.81	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.9	0.76	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	0.72	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.6	0.67	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.3	0.62	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.1	0.60	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0	0.53	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.8	0.49	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.6	0.45	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.7	0.41	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.7	0.43	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.6	0.40	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.5	0.38	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.5	0.35	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.3	0.33	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.2	0.33	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.0	0.31	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	1.9	0.31	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.1	1.7	0.30	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.6	1.7	0.28	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	3.7	1.5	0.12	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	3.9	1.4	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	1.3	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.37	89.0	17.93	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.41	2.87	0.58	0.000
AC-FT	0	0	0	0	0	0	0	0	25	177	36	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.9	3.9	1.2	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	0.00	0.00

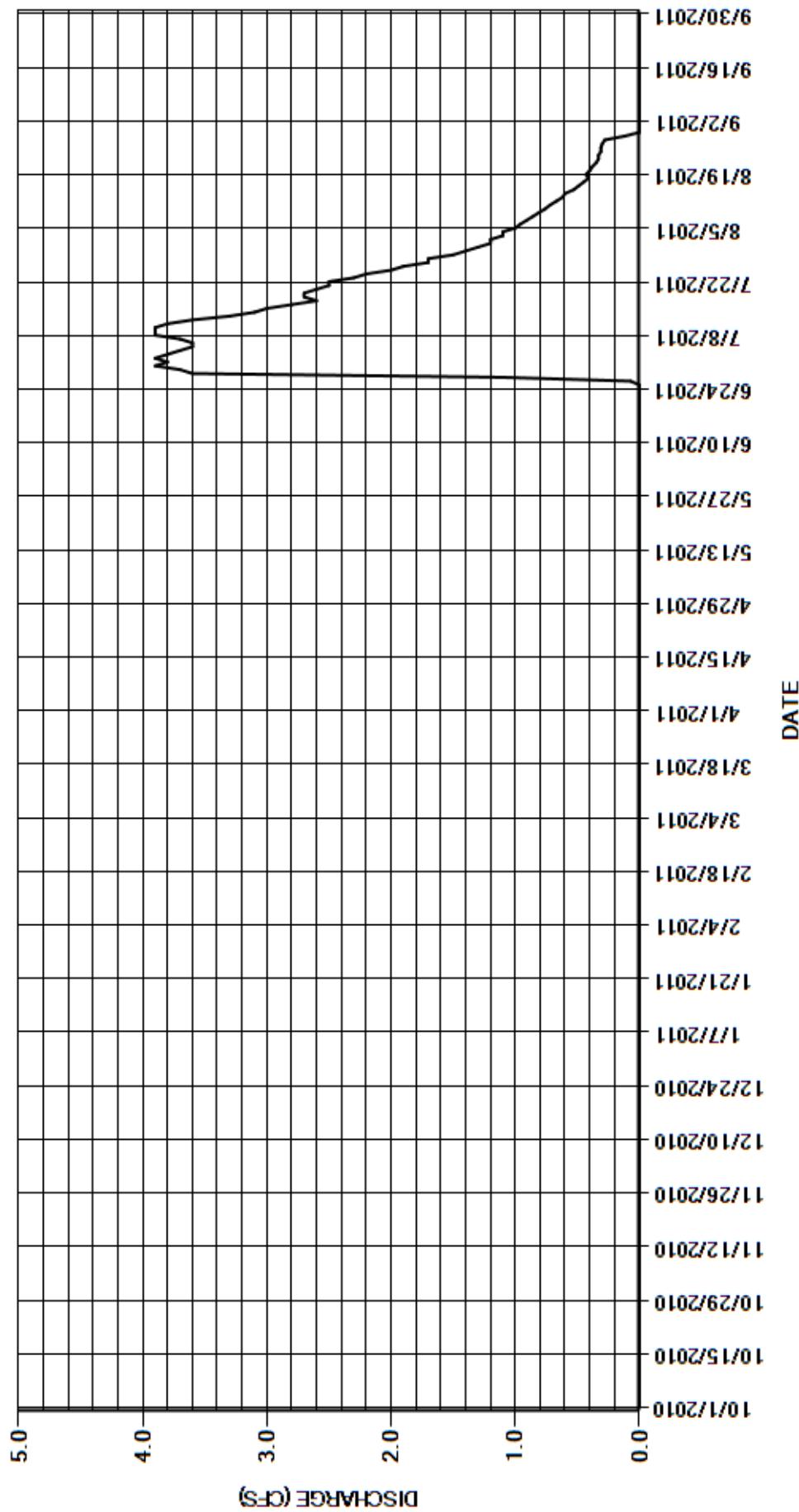
CAL YR	2010	TOTAL	52.39	MEAN	0.14	MAX	3.1	MIN	0.00	AC-FT	104
WTR YR	2011	TOTAL	119.30	MEAN	0.33	MAX	3.9	MIN	0.00	AC-FT	237

MAX DISCH: 4.5 CFS AT 18:00 ON JUL 07,2011 GH 0.87 FT SHIFT -0.04 FT

MAX GH: 0.87 FT AT 18:00 ON JUL 07,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09046000 BOREAS PASS DITCH AT BOREAS PASS
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
09050590 ROBERTS TUNNEL AT EAST PORTAL NEAR GRANT
Water Year 2011

Location.--	Lat. 39°27'50", Long. 105°41'01"; Harold D. Roberts tunnel diverts water from Dillon Reservoir in Blue River basin, to North Fork South Platte River (tributary to South Platte River) in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 4, T. 7 S., R. 74 W., in Platte River basin.
Drainage Area and Period of Record.--	1963 to present.
Equipment.--	Digital incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink 2 Data Collection Platform (DCP) and a Stevens Type A graphic water-stage recorder at a 20-ft. Parshall Flume. An electric tape gage on the instrument shelf is the primary reference with a supplemental staff gage located on the left wing wall of the flume at the Ha location. The station and graphic water-stage recorder is owned and maintained by Denver Water.
Hydrologic Conditions.--	Roberts Tunnel is a transmountain diversion delivering water from Dillon Reservoir in the Colorado River Basin to the North Fork of the South Platte River near Grant, CO. Flow changes are generally stepwise and hydroelectric power is generated in the tunnel upstream of the Parshall Flume. The tunnel will shut down for extended periods of time for maintenance activities and delivery needs.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data and chart record as backup. The record is complete and reliable for the periods of active diversion. Instrument calibration was supported by 13 visits made to the gage. One instrumentation correction of -0.01 ft. was applied as defined by visits. When operated in winter months heat lamps and electric heaters are used to keep the well open. Accuracy is not affected and ice accumulation is generally not an issue. Algal growth in the flume can affect the flume's performance. The flume was cleaned on November 16, 2010 returning a cleaning correction of -0.01 ft.
Datum Corrections.--	Levels were last run on November 27, 2008 using the flume crest as base. The gage was found to be reading accurately.
Rating.--	The control is a 20-foot Parshall Flume. A standard 20-foot Parshall Flume rating, STD20FTPF, was continued in use for all of WY2011. Eleven discharge measurements (Nos. 375-385) were made during the year, ranging in discharge from 43.2 to 385 cfs. Measurements made this year and two observations of no flow cover the range in stage experienced this year well except for the peak event of April 15, 2011. The peak flow of 569 cfs occurred at 1045 on April 15, 2011 at a gage-height of 3.48 ft. with a shift of +0.03 ft. It exceeded high flow Measurement No. 379 made May 4, 2011 by 211 cfs and 0.91 ft of stage.
Discharge.--	Shifting control method was used for all periods of active diversion. Shifts are caused by undesirable approach conditions which can be affected by vegetal growth in the approach section and in the flume itself. In a clean flume, positive shifts have been seen above about 50 cfs. Conversely, negative shifts have been observed at flows below about 10 cfs. This year vegetal growth was allowed to build up as cleaning opportunities were rare and the shift became increasingly positive. Shifts were applied by time as defined by measurements. All measurements were given full weight.
Special Computations.--	Zero flow is determined operationally. Small residuals draining through the flume after the tunnel is turned off were considered to be zero. Zero flow was determined to occur on part of the day or all day on the following days: December 17, 2010 – April 12, 2011 and July 8 – August 8, 2011. An important consideration in shift distribution is the relationship of computed discharges to the flows computed at the North Fork of the South Platte at Grant, ½ mile downstream. Flows at Roberts Tunnel should always be less than Grant. Some native inflow below the Roberts inflow should also be seen at Grant, particularly from Geneva Creek and from Kenosha creek. Shift effects of moss are sometimes worked backward to reconcile flows at Roberts and Grant. A spreadsheet of daily discharges for Roberts Tunnel and North Fork South Platte River at Grant (PLAGRACO) is used to insure that the difference between the two gages is reasonable.
Remarks.--	The record is rated as good. Station maintained by Tony Arnett. Record developed by Tony Arnett and Division One Staff.
Recommendations.--	Measurements made at this gage should always be made in tandem with a measurement at the Grant (PLAGRACO) gage. This record should be worked on a monthly basis to insure that any bad balance of flows existing between Roberts Tunnel and the North Fork South Platte River at Grant gage is addressed promptly. Levels must be run in the 2012 Water Year.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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09050590 ROBERTS TUNNEL AT EAST PORTAL NEAR GRANT

RATING TABLE-- STD20FTP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

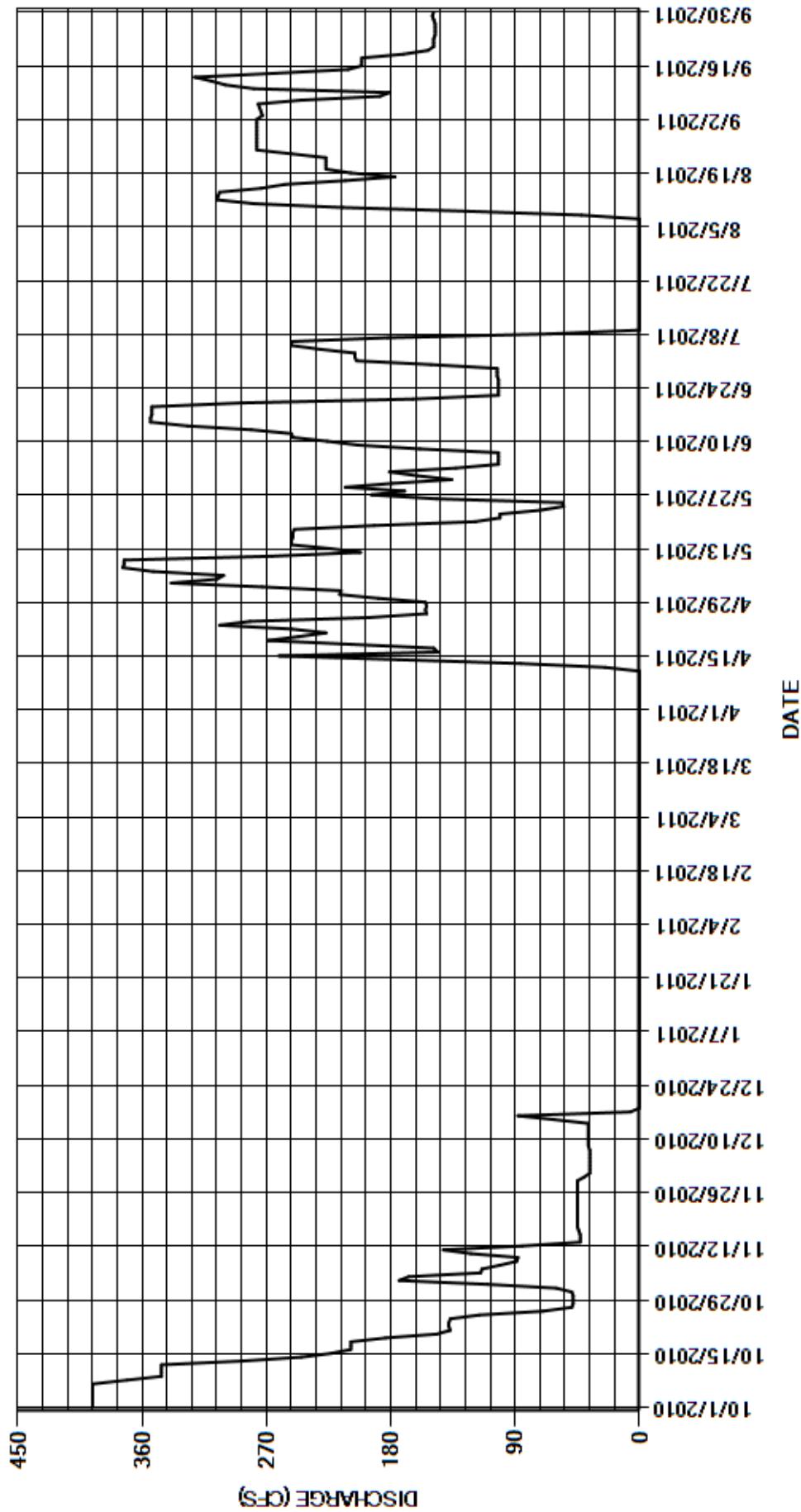
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	396	60	36	0.00	0.00	0.00	0.00	217	161	205	0.00	277
2	396	110	36	0.00	0.00	0.00	0.00	216	181	206	0.00	277
3	396	174	36	0.00	0.00	0.00	0.00	273	133	206	0.00	273
4	396	167	36	0.00	0.00	0.00	0.00	339	102	231	0.00	274
5	396	115	36	0.00	0.00	0.00	0.00	306	102	252	0.00	275
6	396	114	36	0.00	0.00	0.00	0.00	301	102	252	0.00	276
7	396	101	36	0.00	0.00	0.00	0.00	352	102	182	0.00	245
8	371	89	37	0.00	0.00	0.00	0.00	374	159	65	42	188
9	346	88	37	0.00	0.00	0.00	0.00	373	204	0.00	123	181
10	346	122	37	0.00	0.00	0.00	0.00	373	226	0.00	215	279
11	346	142	37	0.00	0.00	0.00	0.00	266	251	0.00	279	300
12	346	85	37	0.00	0.00	0.00	25	202	252	0.00	306	310
13	287	43	37	0.00	0.00	0.00	86	224	281	0.00	305	322
14	245	43	37	0.00	0.00	0.00	174	252	327	0.00	304	264
15	223	43	62	0.00	0.00	0.00	261	252	354	0.00	274	211
16	209	44	88	0.00	0.00	0.00	146	251	354	0.00	257	201
17	209	45	6.5	0.00	0.00	0.00	149	251	353	0.00	213	201
18	209	45	0.00	0.00	0.00	0.00	209	250	353	0.00	177	201
19	184	45	0.00	0.00	0.00	0.00	269	192	353	0.00	209	171
20	147	45	0.00	0.00	0.00	0.00	247	119	288	0.00	227	153
21	137	45	0.00	0.00	0.00	0.00	227	101	164	0.00	227	149
22	138	45	0.00	0.00	0.00	0.00	252	101	102	0.00	227	149
23	138	45	0.00	0.00	0.00	0.00	304	72	102	0.00	227	149
24	137	45	0.00	0.00	0.00	0.00	282	55	102	0.00	252	148
25	116	45	0.00	0.00	0.00	0.00	196	56	102	0.00	277	148
26	70	45	0.00	0.00	0.00	0.00	154	147	102	0.00	277	148
27	49	45	0.00	0.00	0.00	0.00	155	194	103	0.00	277	148
28	48	45	0.00	0.00	0.00	0.00	154	170	103	0.00	277	149
29	48	45	0.00	0.00	---	0.00	155	213	103	0.00	277	150
30	48	40	0.00	0.00	---	0.00	189	179	151	0.00	277	149
31	49	---	0.00	0.00	---	0.00	---	136	---	0.00	277	---
TOTAL	7218	2165	667.50	0.00	0.00	0.00	3634.00	6807	5772	1599.00	5803.00	6366
MEAN	233	72.2	21.5	0.000	0.000	0.000	121	220	192	51.6	187	212
AC-FT	14320	4290	1320	0	0	0	7210	13500	11450	3170	11510	12630
MAX	396	174	88	0.00	0.00	0.00	304	374	354	252	306	322
MIN	48	40	0.00	0.00	0.00	0.00	0.00	55	102	0.00	0.00	148
CAL YR	2010	TOTAL	34452.60	MEAN	94.4	MAX	396	MIN	0.00	AC-FT	68340	
WTR YR	2011	TOTAL	40031.50	MEAN	110	MAX	396	MIN	0.00	AC-FT	79400	

MAX DISCH: 569 CFS AT 10:45 ON APR 15,2011 GH 3.48 FT SHIFT 0.03 FT

MAX GH: 3.48 FT AT 10:45 ON APR 15,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09050590 ROBERTS TUNNEL AT EAST PORTAL NEAR GRANT
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
STRAIGHT CR. TUNNEL AT EAST PORTAL OF EISENHOWER
Water Year 2011

Location.--	Lat. N39° 40' 45.04", Long. W105° 54' 10.02" (NAD83) in Clear Creek County, CO. Gage is located below surface at the Eisenhower Tunnel East Portal facility.
Drainage Area and Period of Record.--	Transmountain diversion. Tunnel is a drainage culvert constructed to carry snowmelt, wash water and treated effluent from the Eisenhower and Johnson tunnels. Water accruing from the tunnel was first adjudicated on 12/31/1970. Daily values are available from the DWR from October 1, 1994 to present.
Equipment.--	Digital incremental Sutron SDR-0001-1 shaft encoder in a NEMA4 enclosure located on the right side of a 1-ft. Parshall Flume located in a concrete lined culvert section subsurface in between the eastbound and westbound lanes of I-70 at the Eisenhower Tunnel East Portal facilities. No provisions for telemetry are available. A staff gage located on the left wing wall at the flume's Ha location is the primary reference. The SDR unit was installed on August 1, 2007 to better monitor flow conditions in the tunnel. Prior to August 1, 2007 weekly observations by Coors staff were used to estimate the record. Coors installed a float actuated datalogger in the 2010 Water Year.
Hydrologic Conditions.--	This is considered to be a transmountain diversion from the Colorado River Basin. The flow is seepage and drainage from cleaning operations inside the Eisenhower Tunnel combined with the effluent from the CDOT facility sewage treatment plant. There is also some degree of runoff from a small drainage immediate to the West Portal which is the source of the water supply for tunnel operations. Spikes in flow originate from the tunnel cleaning operations. The gage shows snow runoff characteristics in summer months.
Gage-Height Record.--	The primary record is 15-minute logged data from the SDR unit. The record is complete and reliable except for: January 28 and 29, 2011 when the SDR unit had to be removed for tunnel lining activities. An in situ polymer style coating reducing friction losses through the tunnel's course was installed. The SDR unit was removed at 0830 on January 28 and reinstalled at 1115 on January 29, 2011. Water was run during this period. The instrument remained in good calibration throughout the year with only one calibration correction of 0.01 ft which was made on November 4, 2010.
	Due to inconsistencies between instrumentation readings of the SDR unit vs. the Coors datalogger in the 2010 Water Year, Coors data was deemed not suitable for backup purposes and was not considered this year.
	Confined space equipment (Oxygen tester & man-hoist) is required when entering the man-hole for any reason.
Datum Corrections.--	Levels were last run May 6, 2009 using the flume's crest as base. The staff gage was found to be within allowable tolerances.
Rating.--	The control is a 1-ft. Parshall Flume. A standard 1-ft Parshall Flume rating, STD01FTPF, was continued for use for all of WY2011. Three discharge measurements (Nos. 11-13) were made this year, ranging in discharge from 0.14 to 2.07 cfs. Measurements made this year cover the range in stage experienced this year well. The peak flow of 2.22 cfs occurred at 1815 on June 30, 2011 at a gage-height of 0.77 ft. with a shift of -0.08 ft. It exceeded high flow Measurement No. 13 by 0.15 cfs and 0.03 ft of stage.
Discharge.--	Stage dependent shifting was used of all periods of record. Shifting is suspected to be caused by friction losses in the approach as well as across the flume; buildup of materials (mostly gravel) upstream of the flume and corrosion of the flume itself. Variable shift table STCTUNCOVST11-1 is defined by 5 measurements (Nos. 8, 11-14) made in the 2009, 2011 and 2012 Water Years. Open water measurements show raw shifts varying between -0.02 and -0.08 ft. All were give full weight.
Special Computations.--	None.
Remarks.--	The record is fair due to the accuracy and limited range of the measurements made, and insufficient staff readings. January 28 and 29 are estimated and poor due to missing values stemming from tunnel lining activities. The accuracy of measurement Nos. 11 and 12 can only be considered fair, since the depths involved were at the lower limit for a Pygmy meter. This record is requested by DWR Division 5 and the Upper Colorado River Commission to complete their accounting of transmountain diversions. Station maintained by Tony Arnett. Record developed by Tony Arnett and R. Stroud.
Recommendations.--	Visits should be made to the gage on a bimonthly basis. Discharge measurements should be continued throughout the full range, especially during peak runoff. Confined space procedures as per CDOT are required for tunnel entry at all times. Tunnel entry coordination with CDOT is required. Attempts to coordinate entry when Coors staff is present should be strived for. Well operation as well as free and clear instrument movement needs to be verified on every visit. Levels should be run in the 2012 Water Year.

STATE OF COLORADO
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STRAIGHT CR. TUNNEL AT EAST PORTAL OF EISENHOWER

RATING TABLE.-- STD01FTPf USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.23	0.21	0.17	0.16	0.11	0.12	0.23	0.19	0.34	2.1	1.1	0.58
2	0.22	0.21	0.16	0.15	0.11	0.12	0.24	0.19	0.39	2.1	1.1	0.55
3	0.22	0.22	0.16	0.15	0.11	0.11	0.25	0.19	0.44	2.2	1.1	0.55
4	0.22	0.20	0.18	0.15	0.11	0.11	0.25	0.19	0.50	2.2	1.1	0.52
5	0.23	0.20	0.17	0.15	0.10	0.11	0.25	0.19	0.59	2.1	1.0	0.52
6	0.24	0.20	0.17	0.14	0.11	0.11	0.25	0.19	0.66	2.1	1.0	0.49
7	0.24	0.20	0.18	0.13	0.11	0.11	0.25	0.19	0.72	2.0	0.98	0.49
8	0.23	0.20	0.19	0.15	0.10	0.11	0.25	0.20	0.78	2.0	0.95	0.47
9	0.22	0.19	0.20	0.14	0.11	0.11	0.27	0.22	0.86	2.0	0.94	0.46
10	0.22	0.20	0.21	0.14	0.10	0.11	0.28	0.23	0.98	2.0	0.92	0.43
11	0.23	0.18	0.21	0.14	0.11	0.11	0.25	0.23	1.1	2.0	0.90	0.42
12	0.23	0.18	0.21	0.14	0.10	0.11	0.25	0.23	1.2	1.9	0.88	0.40
13	0.21	0.18	0.22	0.13	0.11	0.11	0.25	0.23	1.2	1.9	0.86	0.39
14	0.20	0.18	0.20	0.14	0.11	0.12	0.25	0.23	1.3	1.9	0.85	0.38
15	0.20	0.18	0.19	0.13	0.11	0.13	0.25	0.23	1.4	1.8	0.82	0.38
16	0.20	0.18	0.19	0.14	0.11	0.13	0.25	0.23	1.5	1.8	0.81	0.38
17	0.20	0.17	0.19	0.14	0.12	0.13	0.23	0.25	1.6	1.8	0.78	0.38
18	0.23	0.18	0.19	0.14	0.11	0.14	0.23	0.25	1.7	1.7	0.77	0.38
19	0.22	0.18	0.18	0.13	0.11	0.15	0.23	0.25	1.7	1.7	0.74	0.37
20	0.22	0.18	0.19	0.17	0.11	0.15	0.23	0.25	1.7	1.6	0.73	0.35
21	0.22	0.18	0.17	0.14	0.11	0.16	0.23	0.25	1.6	1.6	0.71	0.35
22	0.23	0.18	0.18	0.13	0.12	0.17	0.22	0.24	1.6	1.5	0.71	0.35
23	0.22	0.18	0.17	0.13	0.12	0.17	0.21	0.24	1.6	1.5	0.68	0.34
24	0.21	0.18	0.18	0.13	0.12	0.17	0.21	0.25	1.7	1.4	0.68	0.33
25	0.22	0.17	0.17	0.14	0.11	0.19	0.21	0.23	1.9	1.4	0.68	0.33
26	0.20	0.17	0.16	0.14	0.12	0.19	0.21	0.24	2.0	1.3	0.68	0.33
27	0.22	0.16	0.16	0.13	0.12	0.21	0.21	0.25	2.0	1.3	0.66	0.31
28	0.21	0.17	0.15	e0.13	0.11	0.21	0.21	0.25	2.0	1.3	0.64	0.30
29	0.21	0.17	0.16	e0.13	---	0.21	0.20	0.27	2.1	1.2	0.61	0.30
30	0.21	0.17	0.15	0.11	---	0.22	0.19	0.30	2.1	1.2	0.61	0.30
31	0.22	---	0.16	0.11	---	0.23	---	0.31	---	1.2	0.58	---
TOTAL	6.78	5.55	5.57	4.28	3.10	4.53	7.04	7.19	39.26	53.8	25.57	12.13
MEAN	0.22	0.18	0.18	0.14	0.11	0.15	0.23	0.23	1.31	1.74	0.82	0.40
AC-FT	13	11	11	8.5	6.1	9.0	14	14	78	107	51	24
MAX	0.24	0.22	0.22	0.17	0.12	0.23	0.28	0.31	2.1	2.2	1.1	0.58
MIN	0.20	0.16	0.15	0.11	0.10	0.11	0.19	0.19	0.34	1.2	0.58	0.30

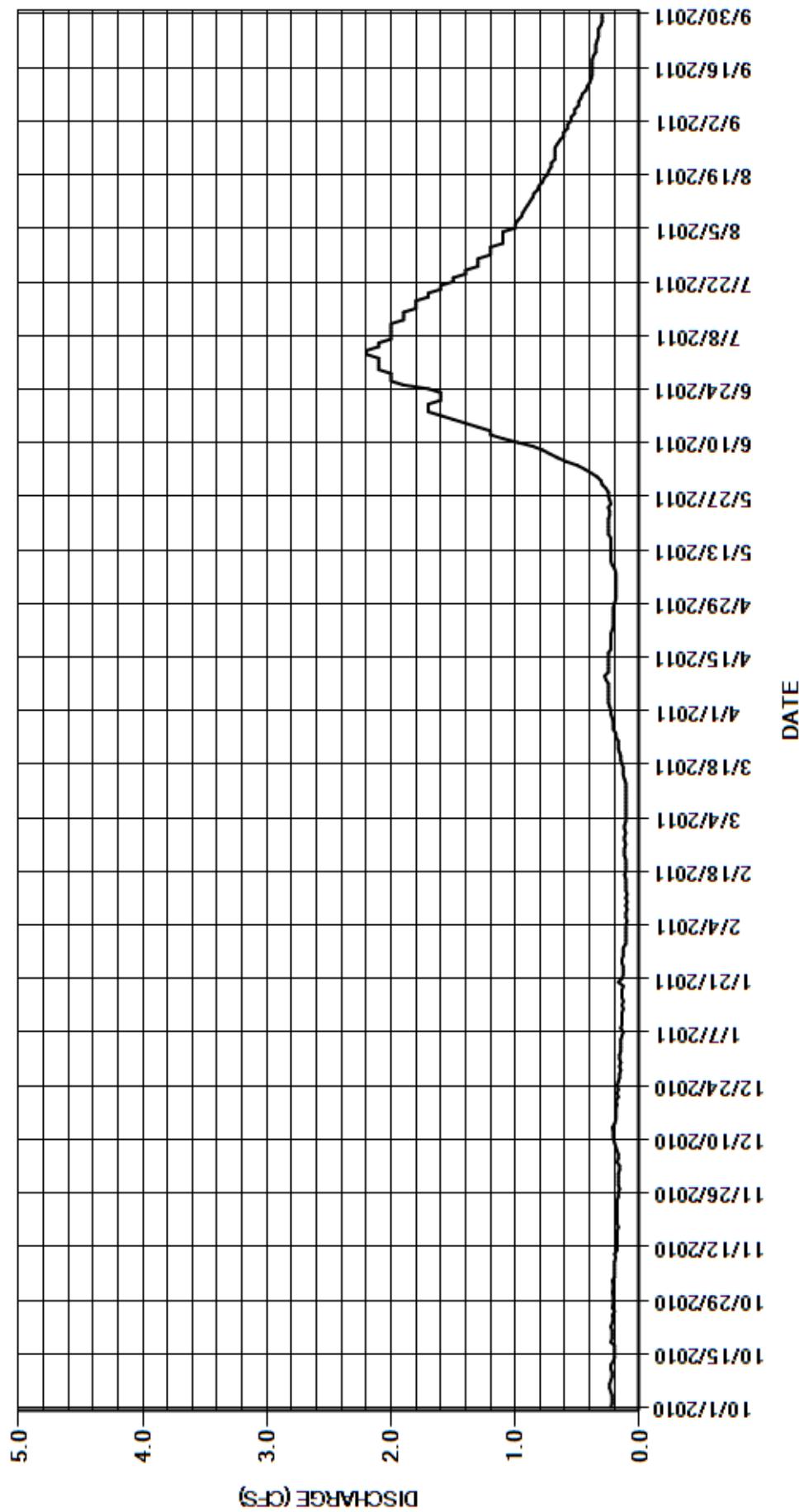
CAL YR	2010	TOTAL	116.27	MEAN	0.32	MAX	1.9	MIN	0.08	AC-FT	231
WTR YR	2011	TOTAL	174.80	MEAN	0.48	MAX	2.2	MIN	0.10	AC-FT	347

MAX DISCH: 2.22 CFS AT 18:15 ON JUN 30,2011 GH 0.77 FT SHIFT -0.08 FT

MAX GH: 0.77 FT AT 18:15 ON JUN 30,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

STRAIGHT CR. TUNNEL AT EAST PORTAL OF EISENhower
WY2011 HYDROGRAPH



PLATTE RIVER BASIN

AUGUST P. GUMLICK TUNNEL aka JONES PASS TUNNEL RELEASE TO CLEAR CREEK

Water Year 2011

Location.--	Lat. 39°46'15", Long. 105°50'55"; in Sec. 24, T.3 S, R.76 W.; Two miles east of Jones Pass at Henderson Mine, 11 miles west of Empire, Colorado.
Drainage Area and Period of Record.--	Diversion is from tributaries of the Williams Fork River in the Colorado River Basin between the headgate on the right bank of Bobtail Creek in Sec. 28, T.3S, R.76 W., and the headgate on the left bank of McQueary Creek in Sec. 16 to the West Fork of Clear Creek in Sec. 24 in the South Platte River Basin. Since July, 1959, Gumlick water has been redirected into the Vasquez Tunnel to Vasquez Creek in Sec. 1, T. 3S. R. 76W., in the Frazier River and Colorado River Basins.
Equipment.--	Sutron SDR-0001-1 and a Steven's F-type graphic water stage recorder in a concrete shelter and stilling well at a 10-ft. Parshall flume. An adjustable reference point and metal drop tape serve as the primary reference with two supplemental staff gages, one located on the right wing wall at the flume's Ha location and the other in the stilling well. The stilling well is connected to the flume with a single 2-in. inlet. Facilities are owned, operated and maintained by Denver Water.
Hydrologic Conditions.--	Transmountain diversion diverting water from tributaries of the Williams Fork River in the Colorado River Basin between the head gate on the right bank of Bobtail Creek in Sec. 28, T. 3S, R. 76W., and the head gate on the left bank of McQueary Creek in Sec. 16, to the West Fork of Clear Creek in Sec. 24 in the South Platte River Basin. Since July, 1959, Gumlick water has been redirected through Vasquez Tunnel to Vasquez Creek in Sec. 1, T. 3S. , R. 76W, in the Frazier River and Colorado River Basins. Delivery through the 10 ft. Parshall into Clear Creek since the completion of Vasquez Tunnel in 1958 was rare prior to 2009. Currently, Denver has contracted with Golden to supply a small amount of water each year to Guanella Reservoir, delivered in one run.
Gage-Height Record.--	The primary record is 15-minute SDR data with photocopies of Denver Water's weekly chart recorder as backup. This year the chart recorder was calibrated to the Ha staff, whereas DWR's SDR was calibrated to the primary reference. As such, the weekly chart was set to the outside staff showing a -0.12 ft correction from the inside drop tape. DWR does not adjust or calibrate the weekly chart instrumentation. The record is complete and reliable. Three visits were made to the gage by DWR staff. The SDR was found to be calibrated correctly on all visits. A visit sheet was not maintained in the station.
Datum Corrections.--	Denver's chart agreed with the SDR when accounting for a 0.22 pen correction after two hours of flow had been recorded and assumed to have been done by Denver Water staff. The last three days of flow recorded by the chart were recorded on a second chart paper and is off-set by 0.10. Water was run from August 3 through 7, 2011. Non-zero GH's recorded October 1 through June 17 were due to residuals in the well and/or snow and ice in the flume.
Rating.--	The control is a 10-ft. Parshall Flume. A standard 10-ft. Parshall Flume rating, STD10FTP, was continued in use for all of WY2011. One discharge measurement (No. 3) was made this year at a GH of 0.58 ft. returning a discharge of 18.6 cfs and a shift of 0.05 ft. The peak flow of 23.8 cfs occurred at 0800 on August 3, 2011 at a gage-height of 0.68 ft. with a shift of 0.05 ft. It exceeded this year's measurement by 5.50 cfs and 0.10 ft of stage.
Discharge.--	Shifts are caused by flume conditions in conjunction with release gate conditions. The flume sits directly below two radial gates. When water is being delivered to the Moffat system, the delivery to the Clear Creek flume is under pressure. Flow leaks out from under the gate. Flow in the flume is very fast, rough and unevenly distributed across the flume. When water is not being delivered, one or both of the gates are completely open. Flow is not under pressure, but does enter the flume at a right angle and pile-up on the inlet side is possible. The degree of this angular flow could also depend on whether both gates are open or only one. This year, delivery occurred when no water was going to the Moffat system. Flow was delivered from the right gate only under non-pressurized conditions. Shifting control method was used for all periods of record. This year's measurement occurred one day after initial diversion started and was give full weight for the entire period of diversion.
Special Computations.--	Zero flow is determined operationally. Residual gage-heights recorded by the SDR occurring before and after the August 2011 delivery do not represent active diversions to Clear Creek and are therefore considered zero.
Remarks.--	Water was released for 5 days in 2011. The record is considered fair since only one measurement was made, and limited observations have been recorded comparing the staff GH to the stilling well.
Recommendations.--	Flume and gate conditions during releases should be photographed and documented, and both staff and stilling well readings should be taken. If the Tunnel is running water to the Moffat system, a copy of the chart from the downstream flume should be obtained for comparison. In 2010, Denver did NOT notify the hydrographic staff of the release, and neither did the commissioner. In 2011, Denver notified DWR of a release the same day the release began. Golden should also be asked to independently provide notification of a release. It is imperative that hydrographers measure and document these releases. Observations and measurements during different gate scenarios are needed to establish the most reliable measurement conditions and request cooperation from Denver.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

AUGUST P. GUMLICK TUNNEL aka JONES PASS TUNNEL RELEASE TO CLEAR CREEK

RATING TABLE.-- STD10FTPf USED FROM 01-AUG-2011 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.6	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	74.60	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.41	0.000
AC-FT	0	0	0	0	0	0	0	0	0	0	148	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

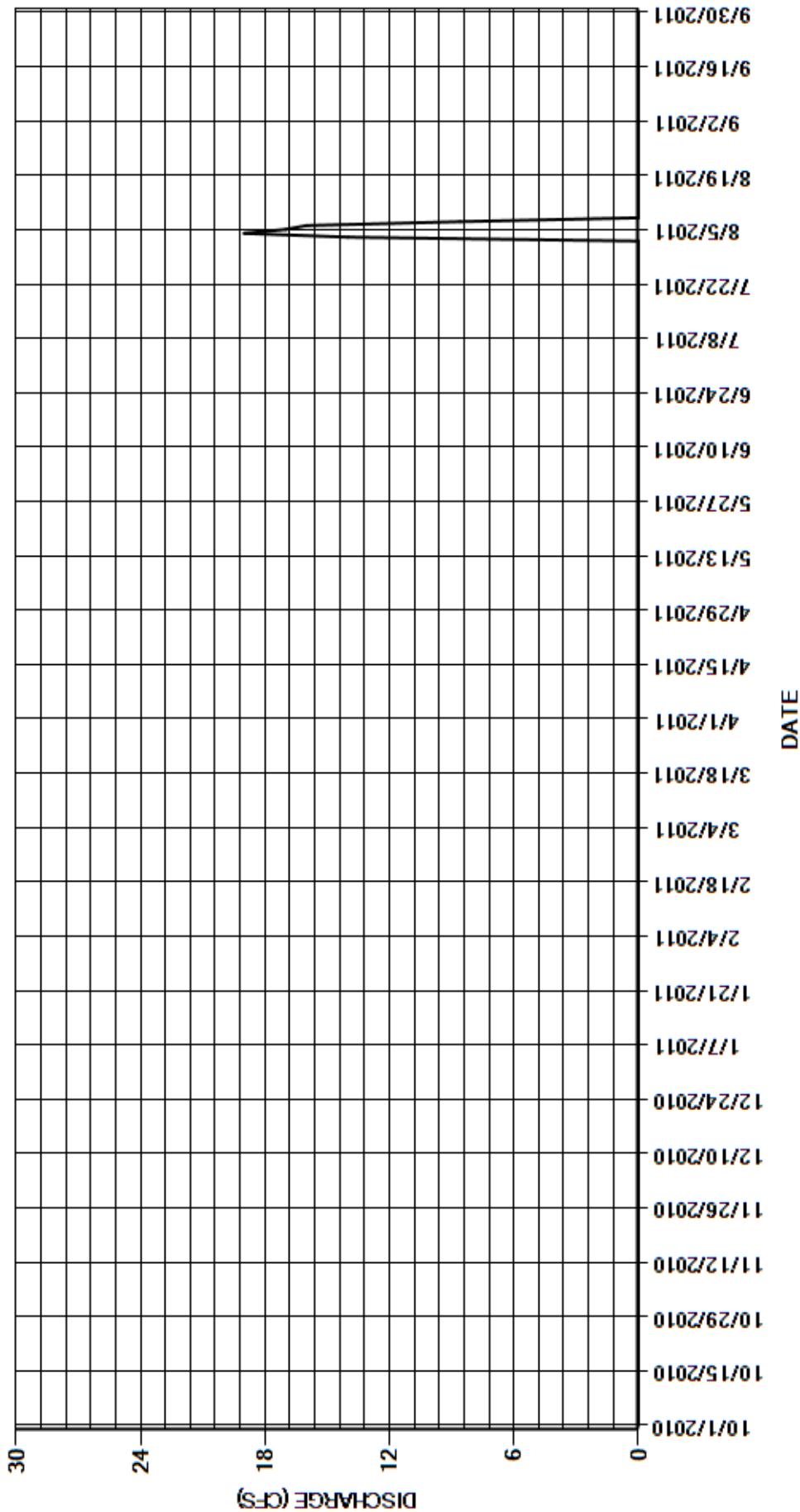
CAL YR	2010	TOTAL	57.60	MEAN	0.16	MAX	13	MIN	0.00	AC-FT	114
WTR YR	2011	TOTAL	74.60	MEAN	0.20	MAX	19	MIN	0.00	AC-FT	148

MAX DISCH: 23.8 CFS AT 08:00 ON AUG 03,2011 GH 0.68 FT SHIFT 0.05 FT

MAX GH: 0.68 FT AT 08:00 ON AUG 03,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

AUGUST P. GUMLICK TUNNEL AKA JONES PASS TUNNEL RELEASE TO CLEAR CREEK
WY2011 HYDROGRAPH



BLUE RIVER BASIN
09047300 VIDLER TUNNEL NEAR ARGENTINE PASS
Water Year 2011

Location.--	Lat. N. $39^{\circ} 37' 22.36''$, Long. w $105^{\circ} 47' 29.61''$ (Spotted from Google Earth (NAD83)). Gage is located in a tunnel at the upstream end of Vidler tunnel near Argentine pass above the Keystone Ski Area in Summit County, CO.
Drainage Area and Period of Record.--	Transmountain diversion diverting water from around Horseshoe Basin; tributary of the Snake River in the Colorado River Basin to Leavenworth creek, tributary to Clear Creek in the South Platte River Basin. Daily values are available from DWR from 1971 to present.
Equipment.--	Digital incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink 2 Data Collection Platform (DCP) transmitting hourly. Shaft encoder is located on the right side of a 3-ft. Parshall Flume approximately 320 ft. downstream from where the DCP is located near the tunnel's west portal entrance. A staff gage on the left wing wall at the flume's Ha location is the primary reference. The City of Golden maintains a secondary SDR-0001-1 at this site. Log files can be made available upon request. The City of Golden owns, operates and maintains all facilities. The satellite monitoring equipment was upgraded and grounding issues affecting the DCP's performance were addressed on July 19, 2011.
Hydrologic Conditions.--	Vidler Tunnel (west portal) is located in Horseshoe Basin, near the base of Argentine Pass. The tunnel is approximately 1.5 miles long and passes across the Continental Divide. Water is diverted into the tunnel by 3 ft CMP and empties into an open rock tunnel about 40 ft from the flume creating a stilling area for the flume gage approximately 5 ft by 40 ft upstream of the flume.
Gage-Height Record.--	The primary record is 15-minute satellite data with logged 15-minute DCP data as backup. Golden's SDR can and did serve as an independent back-up. The record is complete and reliable, except for the following periods: June 22, 2011, start up. Data from Golden's logger was used to establish the start-up period through July 19, 2011. Wiring problems during setup prevented data logging from startup through June 28, 2011. Data were recorded by the DCP from June 28 to July 19, 2011; however, most of the DCP's transmissions were missed from June 28 through July 19, 2011, due to equipment failures at the gage site. Continuous data collection and transmission resumed July 19, 2011 and continued through the end of diversion on September 6, 2011.
Datum Corrections.--	City of Golden shut down the collection system due to damages to the pipeline that runs water from the collection system to the west portal of Vidler Tunnel. Periodic releases and shut downs are seen in the record as result of backhoe work and pipeline replacement.
Rating.--	Levels were last run on June 23, 2000. The staff gage was found to be correctly set with respect to the crest of the flume. Flume dimensions were found to be within close agreement of design parameters, although the floor at the crest does have some slope up towards the crest in the converging section. There is nearly one foot of getaway within 8 ft downstream of the exit of the flume.
Discharge.--	The control is a 3-ft steel Parshall flume positioned in a bare rock tunnel originally constructed for mining. A standard 3 ft Parshall Flume rating, STD03FTPF, was continued this year. Five measurements (Nos. 42-45) were made in WY2011 ranging in discharge from 0.85 to 8.58 cfs. A notched index board is installed on the flume to insure current meter measurement sections are consistent. The measurement section width is 4.5 ft. It is generally agreed by both Golden Water and DWR that some unknown flow is occurring under the flume. Measurement Nos. 42-45 and two observations of no flow cover the range in stage experience this year. The peak flow of 10.9 cfs occurred at 1800 July 28, 2011 at a gage height of 1.00 ft with a shift of -0.06 ft. It exceeded Measurement No. 43 made July 29 by 0.13 ft in stage and 2.3 cfs.
Special Computations.--	Golden's logged data was used as backup data from startup on June 22 to July 19 when all questionable equipment was replaced by DWR. Zero flow is determined operationally. Unit gage-heights values on September 6, 2011 were edited to 0.00 ft. following discontinuation of diversion activities by the City of Golden.
Remarks.--	The record is considered good, except for June 22 to July 19, 2011 when Golden's logs were used as backup for missing data, which is considered fair. Calibration of Golden's instrument as well as multiple calibration corrections appearing in the digital log could not be accounted for. Station operated and maintained by Tony Arnett. Record developed by R. Stroud and Tony Arnett.
Recommendations.--	Greater care should be taken in recording measurement staff readings and calibration information. The reading of Golden's logger should also be recorded on visit logs and measurement field notes. Use of angle coefficients and individual depths should be evaluated and considered in subsequent years. Levels should be run again as time and staff allow.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09047300 VIDLER TUNNEL NEAR ARGENTINE PASS

RATING TABLE.-- STD03FTP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

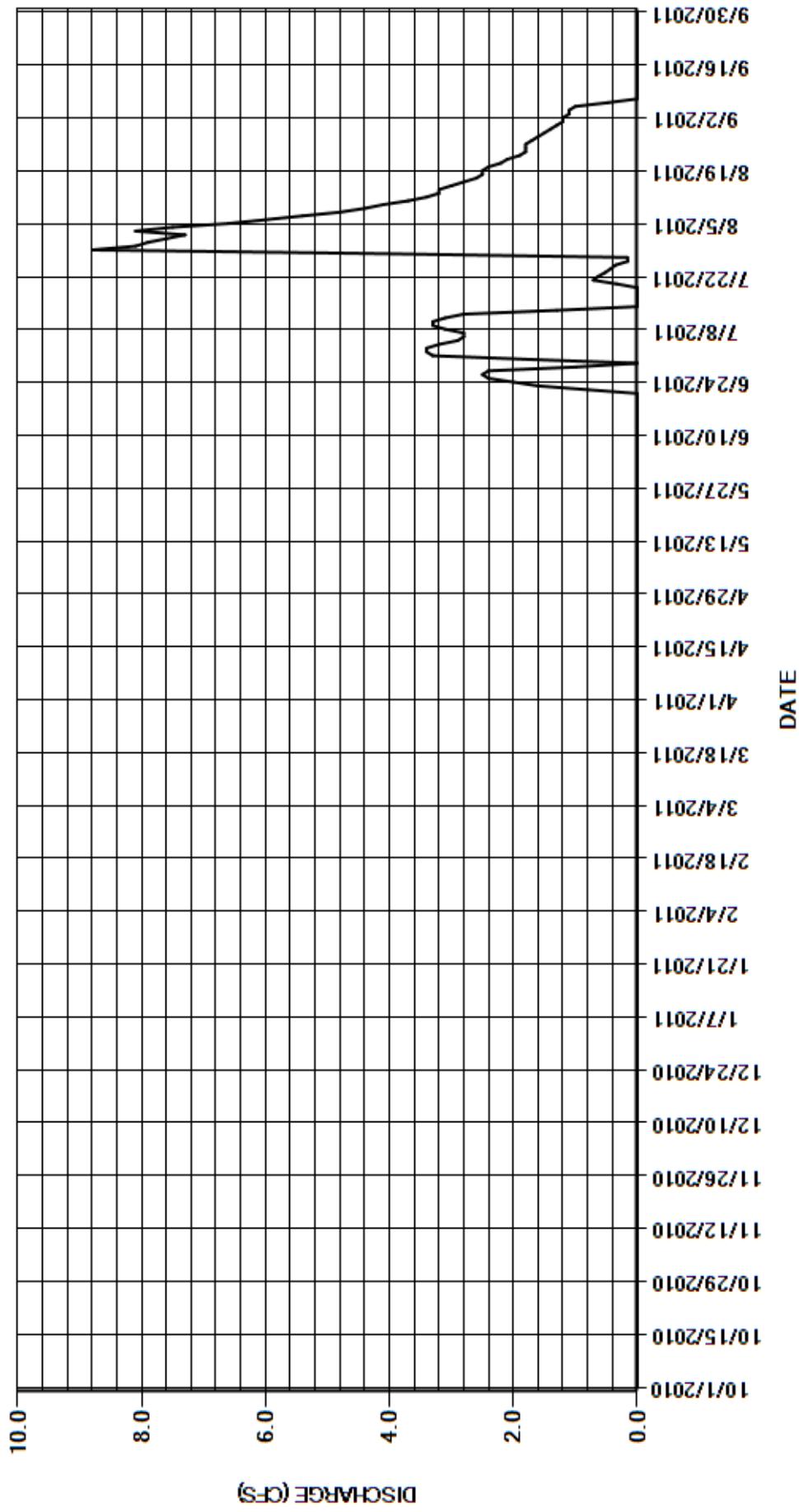
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.3	7.6	1.2
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.4	7.3	1.2
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.4	8.1	1.1
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.2	7.5	1.1
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.9	6.6	1.0
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.8	6.0	0.47
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.8	5.4	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.1	4.8	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.3	4.4	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.3	4.1	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.1	3.7	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.8	3.4	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	3.2	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.2	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.8	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.6	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.5	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.5	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	2.4	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71	2.2	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80	0.63	2.1	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.6	0.52	1.9	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.0	0.43	1.8	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.4	0.35	1.8	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.5	0.15	1.8	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.4	0.16	1.7	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	4.0	1.6	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	8.8	1.5	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	1.7	8.1	1.4	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	7.9	1.3	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.39	70.78	110.2	6.07
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.48	2.28	3.55	0.20
AC-FT	0	0	0	0	0	0	0	0	29	140	219	12
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.5	8.8	8.1	1.2
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	0.00
CAL YR	2010	TOTAL	480.64	MEAN	1.32	MAX	14	MIN	0.00	AC-FT	953	
WTR YR	2011	TOTAL	201.44	MEAN	0.55	MAX	8.8	MIN	0.00	AC-FT	400	

MAX DISCH: 10.9 CFS AT 18:00 ON JUL 28,2011 GH 1.00 FT SHIFT -0.06 FT

MAX GH: 1.00 FT AT 18:00 ON JUL 28,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09047300 VIDLER TUNNEL NEAR ARGENTINE PASS
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
09021500 BERTHOUD PASS DITCH AT BERTHOUD PASS
Water Year 2011

Location.--	Lat. 39° 47' 56.58", Long. 105° 46' 36.37" (NAD83). Gage is located on the left side of a 2.5 ft. by 9 ft. cutthroat flume near the summit of Berthoud Pass.
Drainage Area and Period of Record.--	Transmountain diversion diverting water from tributaries of the Fraser River in Hoop Creek in the Clear Creek Basin. Daily values are available from the DWR from June 18, 1931 to present.
Equipment.--	Digital Incremental Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink 2 Data Collection Platform (DCP) transmitting hourly in a 42-inch corrugated metal pipe shelter and well next to a 2.5-ft. by 9-ft. cutthroat flume. The stilling well has been divided to accommodate a Ha and Hb well. The primary reference is a metal drop tape and an adjustable reference point (RP). A supplemental Ha staff gage is located on the right wing wall in the converging section of the flume. A RP is present for the Hb well but its elevation has not been verified by levels. The gage is owned and operated by the city of Northglenn.
Hydrologic Conditions.--	The ditch drainage is nearly all above tree line and is adjacent to the Berthoud Pass ski area. The ditch runs parallel to US Highway 40 for part of its length and acts to divert snowmelt away from the uphill side of the road. Construction was done at the gage in October and November 2007 to cover the ditch. Prior to construction, snow-plows and traffic would drop debris into the ditch. The incoming ditch itself was replaced with a 36 inch CMP conduit and the flume was covered with sheets of metal. An extra foot of concrete was also added to the walls of the flume, extending them from 3 ft. to 4 ft. in height. The exiting ditch was replaced with a 36 inch corrugated plastic pipe conduit with extensive dirt work done in the gage's vicinity. On September 18, 2009 the flume's inlet was observed to be at a gage-height of 0.13 ft whereas the flume's point of zero flow (PZF) was observed to occur at a staff reading of 0.04 ft. Residual stilling well readings of 0.13 feet and below are assumed to be zero flow.
Gage-Height Record.--	The record is 15-minute telemetered encoder data with 15-minute logged DCP values as backup. The record is complete and reliable for the period of operation. Gage operates seasonally. This year, the DCP was activated by DWR staff on June 21, 2011. Instrumentation was set to a stage of 0.00 ft. because the drop tape was not long enough to read residual water in the stilling well below the flume's zero datum. A significant instrumentation correction was required on July 13, 2011 after water was running due to this erroneous initial stage set point. Water was turned into the ditch on July 7, 2011 and ran through September 28, 2011.
Datum Corrections.--	The RP and tape were first established with respect to the throat of the flume on June 20, 1989. Levels run on October 9, 2008 found the gage to be reading 0.04 ft low. The RP was adjusted back to the previously established elevation 6.630 ft. Movement was possibly caused by construction activities in October and November 2007. Levels were run again on July 14, 2009; November 10, 2009 and August 10, 2010. The RP was found to be in tolerance in all instances
Rating.--	Prior to 2008, the control was a 2.50-foot by 9-foot cutthroat flume, which used a standard cutthroat flume rating (BERDITCO01). Pipe-lining the ditch negated the control of the flume. The control is now the downstream corrugated plastic pipe below the flume. The departing pipe has an invert that is 0.04 feet higher than the average elevation of the flume throat, resulting in submergence of the flume throughout the range of flow. Rating BERDITCO02 was developed in water year 2008 and is based on seven measurements (Nos. 112-118), ranging in discharge from 0.82 to 7 cfs and has subsequently been confirmed by measurements from 0.27 to 15.0 cfs. Four measurements (Nos. 132-135) were made this year ranging in discharge from 2.03 cfs to 15.0 cfs. Discharge measurement made this year cover the range in stage experienced. The peak flow of 21.3 cfs occurred at 2115 July 7, 2011 at a gage height of 1.88 ft. with a shift of 0.09 ft. It exceeded Measurement No. 132 made July 13, 2011 by 0.29 feet of stage and 6.3 cfs.
Discharge.--	Shifts are caused by continually changing downstream conditions and changes in submergence of the flume not addressed by the BERDITCO02 rating. Stage dependent shifting was used for all periods of good record. Variable shift table BERDITCOVST11-1 (applied for all periods of record) is defined by 4 measurements (Nos. 132-135). Open water measurement showed shifts varying from 0.04 to 0.09 ft. All were given full weight except for No. 134 which was discounted -2% to smooth the shift distribution.
Special Computations.--	Zero flow is determined operationally. Residual gage-heights of 0.13 ft and below are considered zero. Unit stage values of 0.13 ft and below occurring on September 28 through October 3, 2011 have been adjusted to zero.
Remarks.--	The record is good. Station maintained by Tony Arnett and record developed by Division One staff.
Recommendations.--	Better coordination and documentation of Northglenn's operations should be strived for. Requesting Northglenn's staff to log their visits to the gage would also be highly valuable. Visits should continue to be made every two weeks throughout the water year to ensure the flume is clear and to ensure instrument calibration. Additionally, better observations of site and flow conditions should be documented on the station's visit log as well as current meter notes. A longer reference tape to measure water levels below the flume's zero datum would be helpful. Higher flow measurements should be sought to extend the BERDITCO02 or subsequent ratings Evaluation for a new rating should be made in the 2012 water year.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09021500 BERTHOUD PASS DITCH AT BERTHOUD PASS

RATING TABLE-- BERDITCO02 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

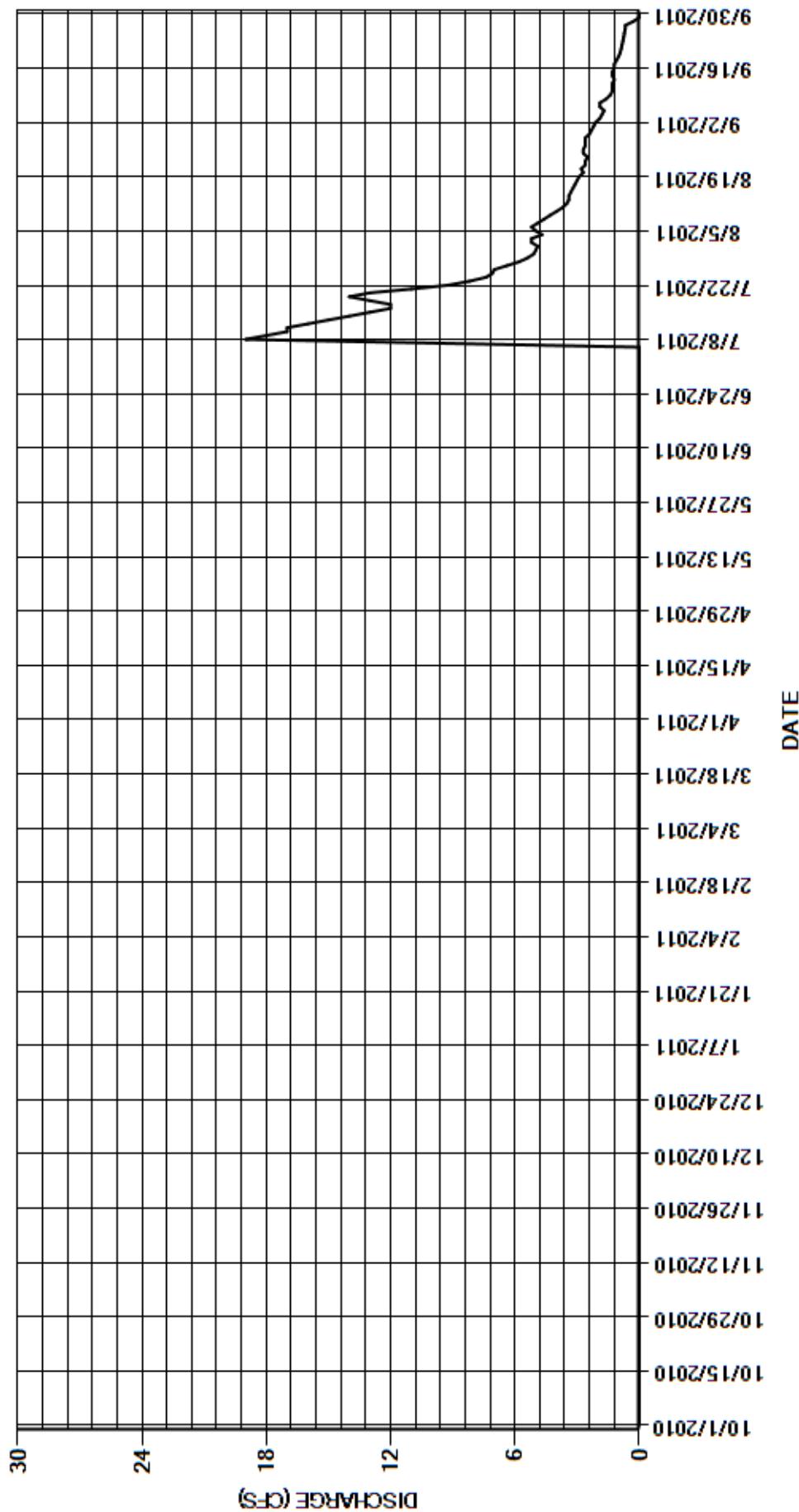
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.9	2.2
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.2	2.1
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.2	1.9
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.7	1.8
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.0	1.7
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.2	1.9
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.6	4.9	1.9
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	4.6	1.6
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18	4.3	1.4
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17	4.0	1.3
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17	3.7	1.3
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16	3.5	1.3
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15	3.4	1.2
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14	3.4	1.3
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13	3.3	1.3
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12	3.2	1.2
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12	3.1	1.2
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13	3.0	1.1
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14	2.9	0.99
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13	2.7	0.92
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11	2.8	0.87
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.2	2.6	0.83
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.2	2.6	0.79
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.4	2.5	0.75
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.1	2.7	0.72
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.0	2.7	0.68
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.4	2.6	0.67
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.8	2.6	0.29
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	5.4	2.6	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	5.1	2.4	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	5.0	2.3	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	280.20	108.6	35.21
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	9.04	3.50	1.17
AC-FT	0	0	0	0	0	0	0	0	0	556	215	70
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	5.2	2.2
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.3	0.00
CAL YR	2010	TOTAL	268.72	MEAN	0.74	MAX	9.4	MIN	0.00	AC-FT	533	
WTR YR	2011	TOTAL	424.01	MEAN	1.16	MAX	19	MIN	0.00	AC-FT	841	

MAX DISCH: 21.3 CFS AT 21:15 ON JUL 07,2011 GH 1.88 FT SHIFT 0.09 FT

MAX GH: 1.88 FT AT 21:15 ON JUL 07,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09021500 BERTHOUD PASS DITCH AT BERTHOUD PASS
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
09022500 MOFFAT WATER TUNNEL AT EAST PORTAL
Water Year 2011

Location.--	Lat. N39° 54' 6.57", Long. 105° 38' 43.77" (NAD83). Gage is located on the right side of a 15-ft. Parshall Flume downstream from Moffat Tunnel's East Portal and 7.6 mi. west of the town of Rollinsville in Gilpin County, CO.
Drainage Area and Period of Record.--	Transmountain diversion delivering waters diverted off the Fraser River and its tributaries and the Williams Fork in the Colorado River Basin to South Boulder Creek in the South Platte River Basin. Daily values are available from the DWR from June 1, 1936 to present.
Equipment.--	F-type graphic water-stage recorder, a digital incremental Sutron SDR-0001-1 shaft encoder connected to a Sutron SatLink 2 Data Collection Platform (DCP) transmitting hourly in a wooden shelter overtop a concrete stilling well at a 15-ft. concrete Parshall Flume. An electric tape gage placed on the instrument shelf is the primary reference with a supplementary staff gage on left wing wall of the flume at the Ha location. The gage is operated in cooperation with Denver Water.
Hydrologic Conditions.--	The flow is collected from transmountain diversions on Vasquez, Frazier-Jim, and Ranch Creeks in the Winter Park area, as well as some water imported from other drainages. Water is collected year-round and will show diurnal variations.
Gage-Height Record.--	The primary record is 15-minute satellite data with 15-minute logged DCP data and 5-minute logged SDR data as backup. Chart record was made available from Denver Water from October 1 through October 29, 2010. The stage-discharge relationship is generally not affected by icing conditions as water is still warm from the tunnel. However, the well will freeze in extreme temperature if heat lamps and space heaters are not turned on or adjusted correctly. Algal growth in the approach channel and flume can affect the flume's performance. Rapid algal generally occurs in the fall, winter and spring months. Fifteen visits by DWR staff were made this year ensuring instrument calibration. The record is complete and reliable with exception of several short periods where incremental stage values were notable higher than the daily trend. It is postulated that the "spikes" were flows of ice hanging on flume's crest occurring on: January 1, 2, 11 and February 10-11, 2011. Incremental values were adjusted to smooth the stage trend. The flume was cleaned on Oct 20, Dec 28, 2010, Apr 8 and Sept 29, 2011. The Oct 20, Dec 28, 2010 and Sept 29, 2011 cleanings did not return cleaning corrections of notable magnitude; however, the April 8, 2011 flume cleaning returned a correction of -0.03 ft. which was applied as a shift by time from the last measurement. From July 11 through July 27, 2011 the tunnel was shut down for maintenance activities, and Denver Water reported zero flow. Residual GH's of 0.05 ft and less were recorded during this period. These residuals were either standing water in the well, or seepage that was not an active diversion. GH's of 0.05 ft. and lower were adjusted to zero for discharge computation purposes.
Datum Corrections.--	Levels were last run on October 12, 2011. The elevation of the primary reference was found to be within allowable tolerances. Reference Marks No. 2 and 3 were established on this date.
Rating.--	The control is a 15-ft. Parshall Flume. A standard 15-ft. Parshall Flume rating, STD15FTP, was continued for all of WY2011. Fourteen measurements (Nos. 635-648) were made during the year, ranging in discharge from 10.5 to 738 cfs. Measurements Nos. 635-648 cover the range in stage experienced this year except for lower daily flows occurring on October 24-29, 2010 and July 11 and 27, 2011 and the higher daily flows of June 7 through 14, 2011. The peak flow of 973 cfs occurred at 2000 on June 6, 2011 at a gage-height of 5.48 ft. with a shift of +0.36 ft. It exceeded high flow Measurement No. 644 made June 8, 2011 by 235 cfs and 0.93 ft. of stage.
Discharge.--	Shifting control method was used all year. The flume is in good condition but negative shifts can be caused by rock and gravel deposition as well as algal growth in the approach canal, flume and flume departure. Higher flows come into the flume with substantial approach velocity, and with faster velocities and deeper depths on the gage side. This leads to positive shifts at higher stages. Special shift distributions are used when flume cleaning changes the shift and staff readings in the flume before and after cleanings. Measurements for this water year show unadjusted shifts varying from -0.03 to +0.36 ft. Shifts were distributed by time through the winter months from October 1, 2010 to May 19, 2011. Through the peak flow of the year, shifts were distributed by stage, using variable stage shift table MOFTUNCOVST1101 as defined by measurement made during the period of use and run from May 19 to August 4, 2011. As flows tapered off and leveled out, shifts were once again distributed by time from August 4 to Sept 30, 2011. All measurements were given full weight, except for measurements 638, 641, 642, and 648, which were adjusted up to 5% to better fit the distribution. Discharge values were adjusted to zero for the period from July 11 thru 27, 2011 when the flow was turned off. A compounded shift can be seen from January 28 thru April 8, 2011 which is the result of a moss cleaning correction.
Special Computations.--	Zero flow is determined operationally. Small residuals draining through the flume after the tunnel is turned off were considered to be zero. Thus, zero flow was determined to occur on part or all day on October 24 and 25, 2010 and from July 11 through 27, 2011.
Remarks.--	The record is good except for the algal growth / flume cleaning correction period which is fair. Station maintained by DWR staff and record developed by Patrick Tyler.
Recommendations.--	The bottom of flume should be cleaned on a regular basis. Steps should be installed into the side of the canal above the flume. A non-standard rating for the flume is possible at the high and low ends if enough mid range clean condition measurements can be made. Levels should be shot again in WY2012 to verify establishment of reference marks 2 and 3.

STATE OF COLORADO
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OFFICE OF STATE ENGINEER

09022500 MOFFAT WATER TUNNEL AT EAST PORTAL

RATING TABLE.-- STD15FTP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

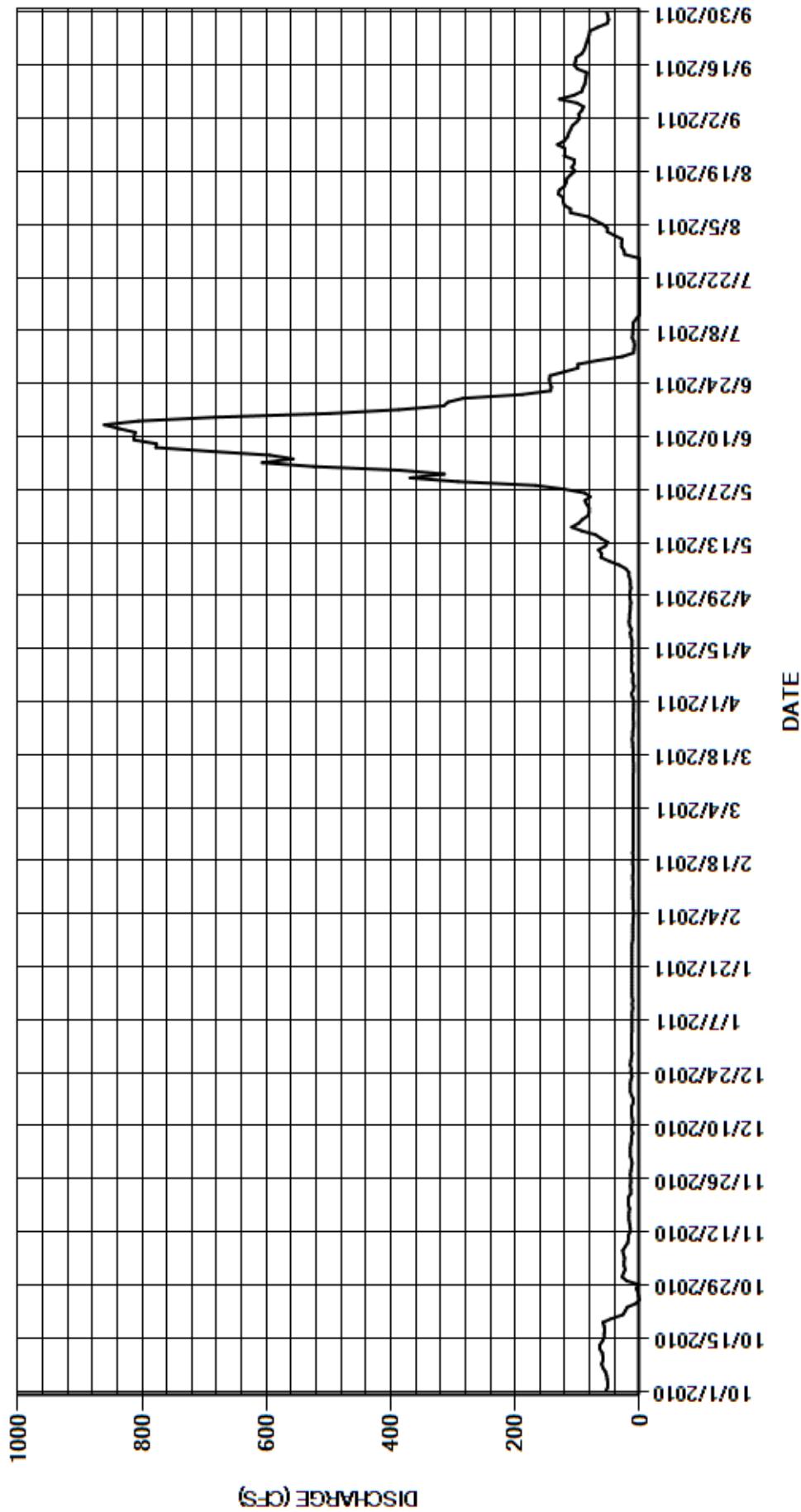
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	54	26	13	13	11	10	9.2	14	385	28	28	101
2	51	23	15	13	10	10	11	15	524	9.7	40	96
3	51	25	15	13	10	10	13	15	607	9.0	52	98
4	52	25	15	12	9.3	10	9.9	17	557	8.3	52	93
5	53	24	14	12	10	9.9	9.1	17	595	9.0	60	90
6	55	26	13	12	10	10	11	22	690	12	72	101
7	59	27	13	12	10	10	11	33	778	11	84	129
8	61	23	11	12	11	10	10	49	777	11	111	106
9	59	19	13	12	11	10	13	62	813	10	111	93
10	59	18	12	11	11	10	13	61	813	10	121	91
11	60	18	11	12	11	10	12	66	811	5.4	123	88
12	64	15	12	11	10	10	13	55	837	0.00	123	87
13	64	15	13	12	11	10	12	51	861	0.00	131	86
14	60	16	13	12	11	9.7	13	62	806	0.00	129	85
15	57	17	13	12	10	9.8	12	71	682	0.00	121	100
16	57	17	10	12	9.9	10	12	93	498	0.00	118	105
17	56	17	10	12	11	10	12	109	387	0.00	117	103
18	57	16	13	12	11	9.9	14	98	315	0.00	111	102
19	59	18	15	12	10	10	15	92	308	0.00	104	93
20	45	18	15	12	11	11	13	83	284	0.00	109	89
21	27	18	15	12	10	11	16	81	189	0.00	105	87
22	23	14	14	12	10	12	17	81	143	0.00	105	85
23	20	14	12	12	10	11	16	85	142	0.00	121	83
24	5.6	15	14	12	10	11	16	88	144	0.00	120	81
25	0.15	14	13	12	10	9.9	15	79	145	0.00	120	80
26	1.8	14	15	12	10	9.8	15	88	144	0.00	132	67
27	2.7	15	14	12	10	10	14	121	121	0.52	121	52
28	5.5	14	13	11	9.9	9.9	15	167	99	24	116	50
29	1.2	13	12	11	---	10	16	292	99	25	114	51
30	21	12	13	11	---	9.8	15	369	67	29	111	53
31	28	---	13	11	---	9.6	---	314	---	29	108	---
TOTAL	1268.95	546	407	369	289.1	314.3	393.2	2850	13621	230.92	3190	2625
MEAN	40.9	18.2	13.1	11.9	10.3	10.1	13.1	91.9	454	7.45	103	87.5
AC-FT	2520	1080	807	732	573	623	780	5650	27020	458	6330	5210
MAX	64	27	15	13	11	12	17	369	861	29	132	129
MIN	0.15	12	10	11	9.3	9.6	9.1	14	67	0.00	28	50
CAL YR	2010	TOTAL	14868.85	MEAN	40.7	MAX	500	MIN	0.00	AC-FT	29490	
WTR YR	2011	TOTAL	26104.47	MEAN	71.5	MAX	861	MIN	0.00	AC-FT	51780	

MAX DISCH: 973 CFS AT 20:00 ON JUN 06,2011 GH 5.48 FT SHIFT 0.36 FT

MAX GH: 5.48 FT AT 20:00 ON JUN 06,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09022500 MOFFAT WATER TUNNEL AT EAST PORTAL
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
ADAMS TUNNEL AT EAST PORTAL-COMPUTED FLOW
Water Year 2011

Location.--	Lat. N40° 19' 40", Long. W105° 34' 42" (NAD83). Gage is located on the right side of a 15-foot Parshall flume located at the upstream end of Aspen Creek Siphon, 600 ft. downstream from the Alva B. Adams Tunnel East Portal afterbay and 4.9 mi. SW of the Town of Estes Park Visitors Center.
Drainage Area and Period of Record.--	Alva B. Adam's Tunnel, the transmountain diversion component of the Colorado-Big Thompson (C-BT) system diverting water from Grand Lake, Shadow Mountain Reservoir and Windy Gap Reservoir in the Colorado River Basin to the South Platte River Basin, 13.35 miles west of the east portal gage. Daily ADANETCO (West Slope Water only) values are available from October 1, 1996 to present. Daily ADATUNCO (gross water through Structure) values are available from August 11, 1947 to present.
Equipment.--	Alva B. Adam's Tunnel (Net) (ADANETCO) is a computed record. This record is comprised of data obtained from the Alva B. Adam's Tunnel Near Estes Park, CO (ADATUNCO), Wind River Near Estes Park, CO (WINDESCO) and Wind River Bypass Below Adam's Tunnel Near Estes Park, CO (WINBYPSCO). See individual records for WINDESCO and WINBYPSCO station equipment. ADATUNCO equipment includes a Sutron SDR-0001-4 shaft encoder and a satellite monitored Sutron SatLink2 data collection platform in a rectangular concrete shelter and concrete Ha / Hb well at a 15-foot Parshall flume. Gage is equipped with electric tape gages on both Ha and Hb wells. A supplementary staff gage is located on the left wing wall of the flume at the Ha location. The well is connected to the stream by two 1.5- inch intakes. Intakes are flushed by a pressure device and have street keys and gate valves. 110 volt power is available to shelter for winter heating. The gage is operated in cooperation with the US Bureau of Reclamation (USBR) and the Colorado Division of Water Resources (DWR) as part of the Colorado-Big Thompson (C-BT) project. On June 27, 2011 satellite equipment was upgraded from a Sutron 8210 DCP and Design Analysis shaft encoder to a Sutron SatLink2 DCP and a Sutron SDR.
Hydrologic Conditions.--	Alva B. Adam's Tunnel, the transmountain diversion component of the Colorado-Big Thompson (C-BT) system empties into a stilling reservoir before entering the measurement flume. The stilling reservoir intercepts native (east slope) water from Wind River. Wind River water can be diverted under the stilling pond, or it can be taken into the pond and run through the C-BT system for power generation purposes (a process called "skimming"). Wind River water is skimmed into the C-BT system during peak runoff periods of the summer when Wind River is in excess of 2 cubic feet per second (cfs). Skimmed water is determined from the difference of Wind River Above Adam's Tunnel (WINDESCO) and Wind River Below Adam's Tunnel (WINBYPSCO). Skimming operations of Wind River occurred from May 23, 2011 (1000) to August 1, 2011 (1315).
Gage-Height Record.--	Computed record. See gage-height record comments for individual gages.
Datum Corrections.--	Computed record. See individual gage station analyses.
Rating.--	Computed record. See individual gage station analyses.
Discharge.--	Computed record. See special computations section for discharge computations. The computed peak discharge of 587 cfs occurred at 0915 February 12, 2011 at a gage height of 4.22 ft with a shift of +0.04 ft. The peak did not occur during skimming operations, thus this peak is also the peak for the ADATUNCO gage.
Special Computations.--	Discharge for the ADANETCO gage is determined by calculating the amount of skimmed Wind River water moved through the ADATUNCO structure, then subtracting that amount from the ADATUNCO record on days when skimming occurred. Thus, $\text{ADANETCO} = \text{ADATUNCO} - (\text{WINDESCO} - \text{WINBYPSCO})$ Skimming operations occurred May 23, 2011 (1000) to August 1, 2011 (1315). This is a computed record. During the skimming operation a total of 1256 acre feet of water was diverted into the C-BT system from Wind River for power generation purposes.
Remarks.--	The majority of flow in this computed record is through the ADATUNCO structure. The ADANETCO record is rated as per ADATUNCO: "The record is good except for the algal growth / flume cleaning correction period (June 8 -15, 2011) and the float tape slipping period (June 28, 2011 (0215) to June 29, 2011 (1145)) which are considered fair. The peak gage-height and discharge are considered good. Zero flow is determined operationally". Computed record developed by Russell V. Stroud. Individual stations maintained by and records developed by Russell V. Stroud.
Recommendations.--	

STATE OF COLORADO
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ADAMS TUNNEL AT EAST PORTAL-COMPUTED FLOW

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

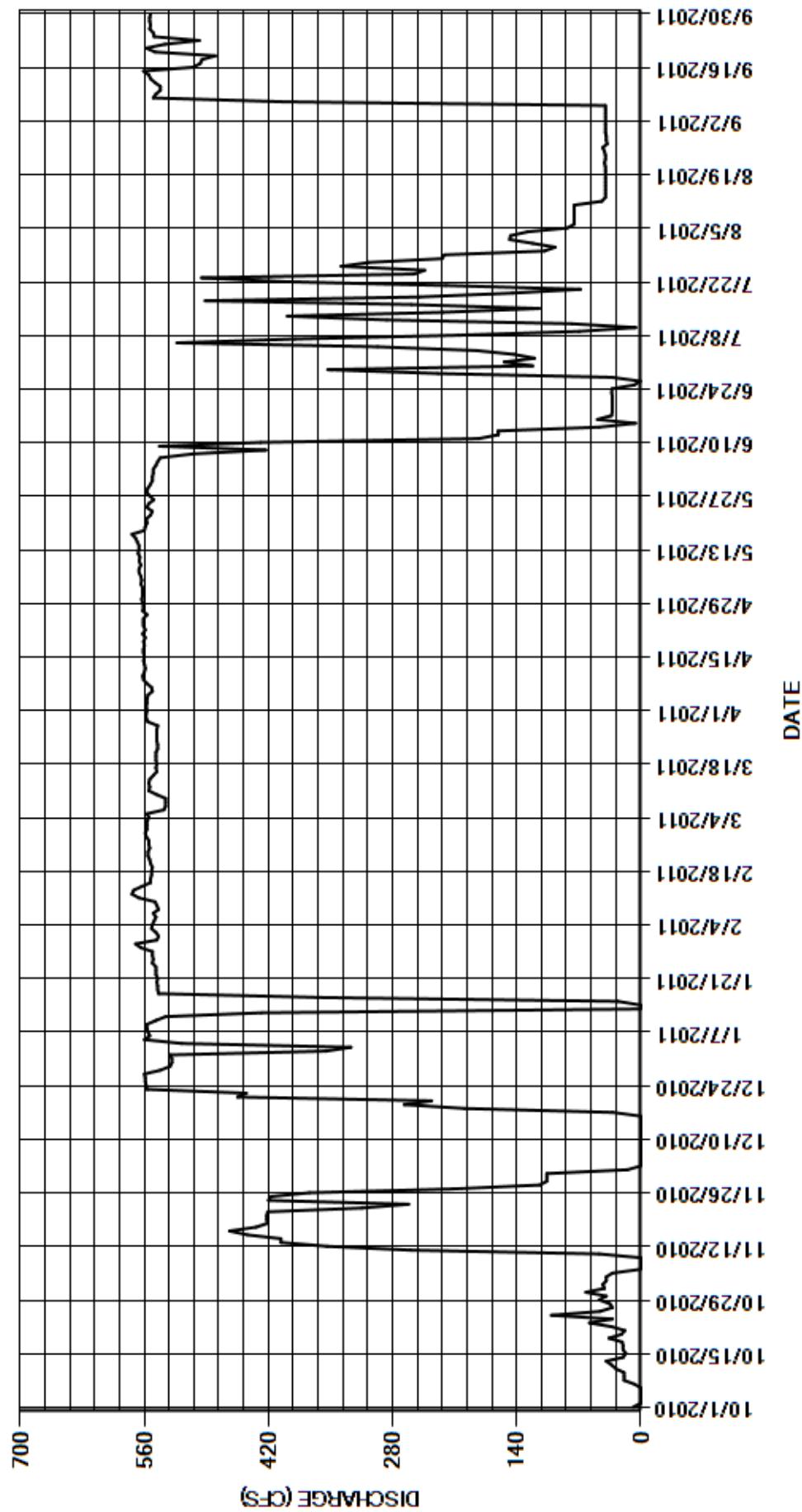
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.7	41	106	531	544	557	557	562	551	154	122	40
2	0.00	43	15	355	547	557	558	562	550	120	148	40
3	0.00	39	0.00	327	552	557	557	562	550	143	147	40
4	0.00	39	0.00	518	551	555	557	564	547	185	128	40
5	0.00	32	0.00	560	549	557	556	563	545	297	83	40
6	0.00	0.28	0.00	554	547	538	551	564	542	523	75	40
7	7.2	0.00	0.00	556	550	536	552	566	505	390	75	406
8	19	0.00	0.00	557	544	536	557	566	423	206	75	550
9	19	0.00	0.00	557	546	536	561	564	543	70	75	547
10	19	47	0.00	547	548	546	562	566	429	5.7	75	542
11	28	260	0.00	536	566	555	560	565	183	78	75	542
12	33	354	0.00	428	574	554	559	567	161	286	44	548
13	39	406	0.00	0.40	572	555	560	566	161	399	40	553
14	20	406	0.00	0.00	563	554	561	566	47	223	40	555
15	17	444	0.00	26	553	550	560	568	6.0	115	40	561
16	20	464	0.00	359	553	546	561	570	49	259	40	505
17	20	434	32	544	552	547	561	574	33	491	40	497
18	21	421	199	545	552	546	560	560	32	249	40	495
19	36	422	267	545	551	547	561	559	32	145	40	480
20	22	422	236	546	553	547	559	557	32	68	40	548
21	18	421	455	545	554	547	562	558	32	220	40	558
22	33	315	445	547	556	545	559	553	32	402	41	537
23	58	262	557	547	556	545	561	551	33	496	40	498
24	32	420	558	547	554	546	561	557	33	256	40	549
25	101	417	559	551	555	546	561	555	7.6	244	41	550
26	46	374	559	550	555	546	557	549	0.50	338	43	554
27	32	211	560	551	558	546	562	554	33	307	38	553
28	35	114	542	551	559	545	561	558	229	224	39	554
29	47	106	531	564	---	556	562	556	353	222	39	554
30	39	106	529	570	---	558	563	553	122	109	40	553
31	62	---	529	546	---	558	---	551	---	97	40	---
TOTAL	831.90	7020.28	6679.00	14660.40	15514	17014	16779	17386	6796.10	7321.7	1883	13029
MEAN	26.8	234	215	473	554	549	559	561	227	236	60.7	434
AC-FT	1650	13920	13250	29080	30770	33750	33280	34490	13480	14520	3730	25840
MAX	101	464	560	570	574	558	563	574	551	523	148	561
MIN	0.00	0.00	0.00	0.00	544	536	551	549	0.50	5.7	38	40
CAL YR	2010	TOTAL	102256.34	MEAN	280	MAX	560	MIN	0.00	AC-FT	202800	
WTR YR	2011	TOTAL	124914.38	MEAN	342	MAX	574	MIN	0.00	AC-FT	247800	

MAX DISCH:

MAX GH: 0.00 FT (N/A. See individual records for peak information.)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ADAMS TUNNEL AT EAST PORTAL-COMPUTED FLOW
WY2011 HYDROGRAPH



PLATTE RIVER BASIN

09010000 GRAND RIVER DITCH AT LA POUDRE PASS @ 10 FT PARSHALL FLUME

Water Year 2011

Location.--	Lat. N40° 28' 39", Long. W105° 49' 19"(NAD83) in the Cache La Poudre River Basin.
Drainage Area and Period of Record.--	Transmountain diversion. Converging near La Poudre Pass are two collection ditches. The north collection ditch is 15-miles long, winding around the east slope of the Never Summer Mountain Range, and the south collection ditch is 2-miles long and diverts water from Specimen Creek. Water is diverted into La Poudre Creek and stored in Long Draw Reservoir. Daily values are available from May 16, 1928 to present.
Equipment.--	F-Type graphic water-stage recorder and a Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink2 satellite monitored data collection platform in a 6-foot by 6-foot timber shelter overtop a 3-foot by 3.5-foot concrete stilling well at a 10-foot Parshall flume. A metal drop tape and reference point serve as the primary reference. A supplemental staff gage is placed in the stilling well but it is not accurate.
Hydrologic Conditions.--	Regulated diversion. This was an above average year for snow-pack. The ditch was turned off on October 19, 2010. It turned on again on June 7, 2011 and ran through September 27, 2011.
Gage-Height Record.--	The primary record is 15-minute satellite data with chart record as backup. The record is complete and reliable from October 1 through October 19, 2010 when the station was turned off for winter and from June 7, 2011, when the station was turned on again, through September 27, 2011, when the station was winterized for the season.
Datum Corrections.--	Levels were last run on July 7, 2009 from the flume crest (two shots) to the IG.
Rating.--	The control is a 10-foot concrete Parshall flume. A standard 10-foot Parshall flume rating (STD10FTP) was continued again this year. One discharge measurement (No. 65) was made during the year at a discharge of 77.5 cfs. The peak flow of 228 cfs occurred at 2045 on July 25, 2011 at a gage-height of 3.00 feet with a shift of 0.00 feet.
Discharge.--	This year's measurement and previous year's measurements do not show signs of permanent shifting conditions. Historically, measurements within +/-5% of the rating have been adjusted to the rating. This year's measurement was adjusted -2% to the rating. The rating was applied directly to the gage-height record to compute discharge.
	Zero flow is determined operationally. A residual gage-height value of 0.02 ft. was observed by the shaft encoder on September 27, 2011 prior to winterization and "off" notation. Gage-heights on September 26, 2011 (1930 - 2345) were adjusted to compute a zero discharge.
Special Computations.--	None.
Remarks.--	The record is good. This is a seasonal diversion that does not operate in the winter. Ancillary flows occurring in the ditch prior to starting the chart recorder and DCP are not credited. Station maintained by Mark Simpson and Lee Cunning. Record developed by Lee Cunning.
Recommendations.--	Levels should be run in the 2012 Water Year. The RP should be checked against the average crest elevation to verify it and the tape length. Two additional reference marks should be established independent of flume structure. A measurement bridge over the flume, in front of the gage house should be built. The chart recorder float hangs up on something as it rises above GH= 2.88 ft. The obstruction should be removed or the recorder repositioned.

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09010000 GRAND RIVER DITCH AT LA POUDRE PASS @ 10 FT PARSHALL FLUME

RATING TABLE.-- STD10FTP1 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

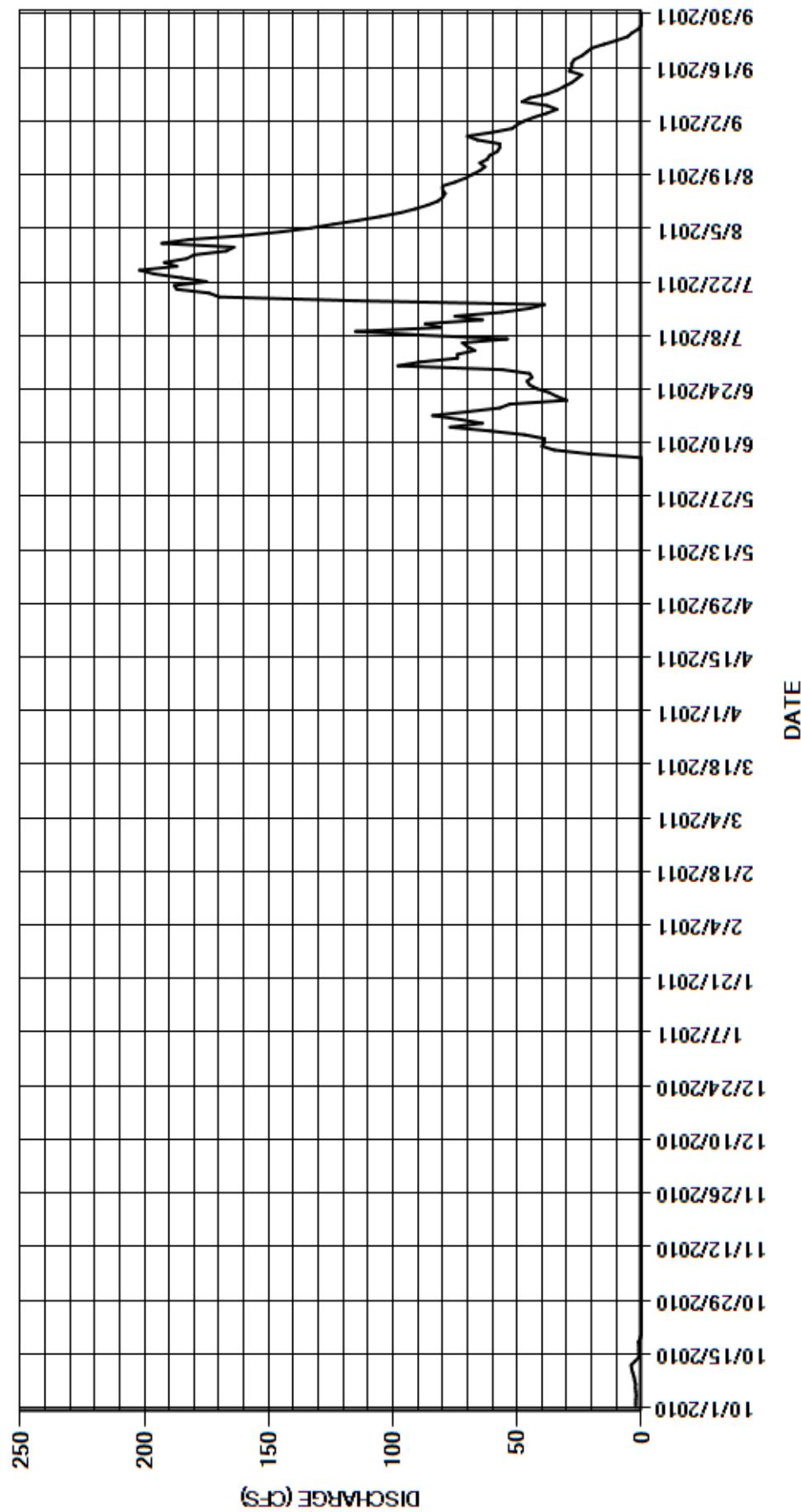
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	89	193	50
2	2.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	74	182	47
3	2.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	74	161	43
4	2.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	67	145	38
5	2.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	70	133	34
6	2.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	72	124	38
7	2.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21	54	114	48
8	2.7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35	88	105	45
9	3.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40	115	97	38
10	3.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	39	81	91	34
11	3.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	39	87	86	31
12	4.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	47	64	82	28
13	2.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	61	75	80	26
14	1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	77	56	79	24
15	1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	64	45	80	29
16	1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	73	39	80	28
17	1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	84	115	75	28
18	1.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	70	170	71	27
19	0.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	57	174	68	24
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	53	187	65	22
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30	188	63	20
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34	175	65	15
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37	185	62	10
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	42	196	61	5.5
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	45	202	58	3.7
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	46	187	57	1.2
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	44	192	57	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	45	183	66	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	56	180	70	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	98	167	60	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	164	52	---
TOTAL	40.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1237.00	3815	2782	737.40
MEAN	1.32	0.000	0.000	0.000	0.000	0.000	0.000	0.000	41.2	123	89.7	24.6
AC-FT	81	0	0	0	0	0	0	0	2450	7570	5520	1460
MAX	4.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	98	202	193	50
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	39	52	0.00
CAL YR	2010	TOTAL	7054.74	MEAN	19.3	MAX	252	MIN	0.00	AC-FT	13990	
WTR YR	2011	TOTAL	8612.34	MEAN	23.6	MAX	202	MIN	0.00	AC-FT	17080	

MAX DISCH: 228 CFS AT 20:45 ON JUL 25,2011 GH 3.00 FT SHIFT 0 FT

MAX GH: 3.00 FT AT 20:45 ON JUL 25,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09010000 GRAND RIVER DITCH AT LA POUDRE PASS @ 10 FT PARSHALL FLUME
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
CAMERON PASS DITCH NEAR CAMERON PASS
Water Year 2011

Location.--	Lat. N40° 31' 14", Long. W105° 53' 32" (NAD83). Gage is located near the summit of Cameron Pass on the right side of a 2-foot concrete Parshall flume.
Drainage Area and Period of Record.--	Transmountain diversion, diverting water from Michigan River tributaries in the North Platte River Basin to Joe Wright Creek in the South Platte Basin. Daily values available from May 25, 1930 to present.
Equipment.--	Standalone Sutron SDR-0001-1 shaft encoder in a timber shelter overtop a concrete stilling well at a 2-foot concrete Parshall flume. The primary reference is a staff gage located in the stilling well.
Hydrologic Conditions.--	No water was diverted in WY2011.
Gage-Height Record.--	No gage-height record available. The SDR unit was never installed as no water was diverted this year.
Datum Corrections.--	Levels were last run on August 20, 2009 using R.M. 1 as base. The staff gage was found be 0.020 ft. high with respect to the base. It is unclear if the staff gage was adjusted at the time of levels or anytime thereafter.
Rating.--	A standard 2-ft. Parshall flume rating is used if there is flow. The rating has been verified to 5.76 cfs. No measurements were made in WY2011.
Discharge.--	Zero flow all year.
Special Computations.--	None.
Remarks.--	Record is good. No water was run during WY2011. Station maintained and record developed by Lee Cunning.
Recommendations.--	Additional measurements throughout the range in stage to verify the rating and evaluate the flume's performance should be watched for. Levels must be run in the 2012 water year to clarify what happened with the primary reference in WY2009. Reinstallation of the staff gage inside of the stilling for better or more accurate reading should be considered at that time.

STATE OF COLORADO
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CAMERON PASS DITCH NEAR CAMERON PASS

RATING TABLE.-- STD02FTP1 USED FROM 01-OCT-2010 TO 30-SEP-2011

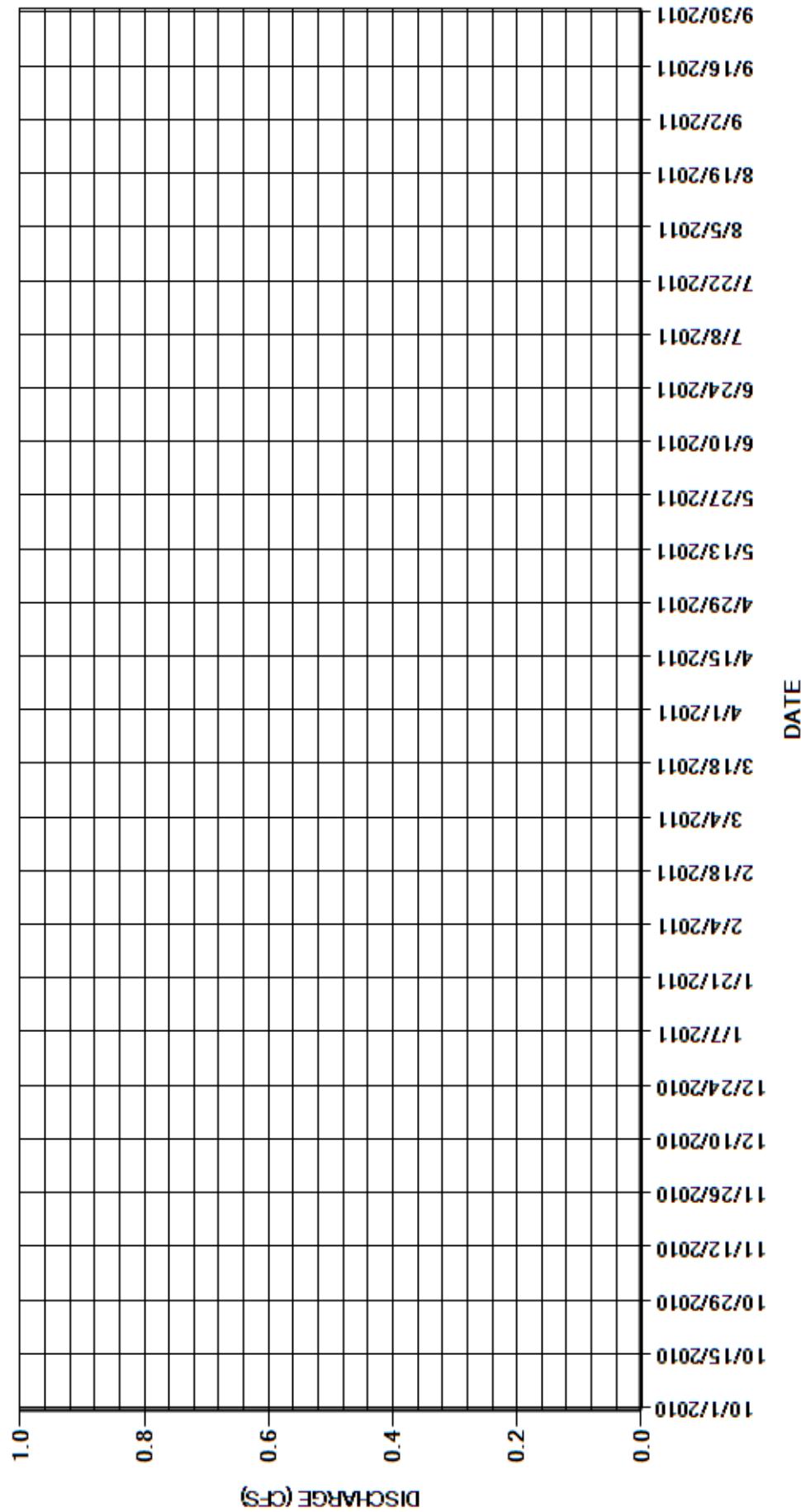
DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011												
DAY	MEAN VALUES											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AC-FT	0	0	0	0	0	0	0	0	0	0	0	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAL YR	2010	TOTAL	0.00	MEAN	0.000	MAX	0.00	MIN	0.00	AC-FT	0	
WTR YR	2011	TOTAL	0.00	MEAN	0.000	MAX	0.00	MIN	0.00	AC-FT	0	

MAX DISCH: (No water diverted in WY2011)

MAX GH: 0.00 FT (No water diverted in WY2011)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CAMERON PASS DITCH NEAR CAMERON PASS
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06746000 MICHIGAN DITCH AT CAMERON PASS
Water Year 2011

Location.--	Lat. 40°31'14", Long. 105°53'30"; Diverts water from Michigan River and tributaries, to Joe Wright Creek (tributary to Cache la Poudre River) in sec. 2, T.6 N., R. 76 W.
Drainage Area and Period of Record.--	N/A.
Equipment.--	Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink 2 data collection platform and weekly graphic water-stage recorder in a log shelter with a PVC well at 8 foot Parshall flume. An inside electric tape to the stilling well serves as the primary reference gage. The structure also has a 0.75-foot or 9-inch Parshall that sits side by side with the 8-foot flume. This allows winter and low flows (flows below about 4.5 cfs) to be measured. Two rating tables are used. The crest height for both flumes is tied to a single electric tape, as both flumes share a common stilling well. The shelter is heated by propane so that the flume and well are free of ice. City of Fort Collins personnel put sections of halved 2 foot culverts in the ditch below the flume to stop the back water conditions experienced in the past.
Hydrologic Conditions.--	Transmountain diversion. Last water year 3,630 acre-feet were diverted. This water year only 657 acre-feet were diverted.
Gage-Height Record.--	Primary record is 15 minute data taken from satellite monitoring with chart backup. Encoder calibration was supported by weekly visits. The record is complete and reliable except for the following days: May 29 - June 3, 2011, when there was backwater from melting ice/snow below the gage. On September 8, 2011 the ditch was shut off, residual GH's observed in the flume during this period (Gage Heights below 0.10) represent seepage flows which were removed from the ditch between the gage and the highway. Diversion flows were measured in the 9-inch Parshall Flume all year.
Datum Corrections.--	Levels were run for the first time on August 24, 2010. The two flume crests were found to be 0.03 ft different in elevation. However, the common RP was set to an elevation between the two crests, so that the tape length agreed to within +/- 0.02 ft. with the crest of both flumes. A secondary reference mark, RM 3, a bolt in the top of the upstream right wing-wall was established.
Rating.--	Since diversion of water was limited to the 9-inch Parshall Flume all year a 0.01 ft datum correction was applied all year to account for the discrepancies listed above.
Discharge.--	There are no sources of shift other than movement of the flume crests and this has not been observed. Discharge measurement No. 39 had a datum corrected shift of 0.00 ft. The rating was directly applied to the datum corrected gage-height record to compute discharge.
Special Computations.--	Discharge estimates for ice affected days: May 28 - June 3, 2011 when downstream ice caused backwater in the flume were made using adjacent good record .
Remarks.--	The record is considered good, except for the period of backwater due to melting snow and ice, which were estimated and poor. No diversion took place from September 8, 2011 - September 30, 2011. Station maintained and record developed by Lee Cunning.
Recommendations.--	Transition from the 8 ft to the 9 in. flume in the fall should be observed and a pygmy meter measurement should be made in the 8 ft. flume just prior to the switch. The height of the boards placed in front of the 8 ft. flume should be documented. If flows above a GH of 2.00 ft are possible in the 9 in flume, the rating will need to be verified. The electric tape gage should be set to the 8-foot Parshall flume datum and the 9-inch record should be adjusted accordingly when in use.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06746000 MICHIGAN DITCH AT CAMERON PASS

RATING TABLE.-- STD09INPF USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.7	1.6	0.81	0.59	0.46	0.37	0.24	0.20	e0.70	2.8	2.9	0.55
2	1.7	1.9	0.81	0.59	0.46	0.37	0.25	0.20	e0.80	2.7	2.6	0.55
3	1.6	2.1	0.80	0.59	0.45	0.37	0.24	0.19	e1.0	2.5	2.4	0.53
4	1.6	2.1	0.81	0.59	0.44	0.37	0.24	0.19	0.99	2.3	2.2	0.52
5	1.6	2.1	0.81	0.57	0.41	0.37	0.24	0.19	1.1	2.2	2.0	0.50
6	1.7	2.2	0.81	0.56	0.39	0.37	0.22	0.20	1.4	2.0	1.9	0.69
7	1.6	2.1	0.79	0.56	0.39	0.37	0.22	0.20	1.5	1.9	1.7	0.74
8	1.7	2.2	0.78	0.56	0.39	0.37	0.22	0.21	1.4	2.0	1.6	0.38
9	1.7	1.3	0.78	0.56	0.41	0.37	0.22	0.23	1.4	1.9	1.5	0.00
10	1.7	1.8	0.78	0.56	0.41	0.35	0.22	0.32	1.4	1.8	1.4	0.00
11	2.4	2.0	0.78	0.55	0.41	0.34	0.22	0.16	1.3	1.7	1.3	0.00
12	2.2	1.9	0.76	0.54	0.41	0.32	0.22	0.10	1.4	1.5	1.2	0.00
13	2.1	1.7	0.76	0.54	0.41	0.30	0.22	0.11	1.4	1.4	1.1	0.00
14	2.0	1.5	0.76	0.54	0.41	0.29	0.22	0.14	1.6	1.2	1.1	0.00
15	2.0	1.5	0.76	0.54	0.41	0.28	0.22	0.15	1.7	1.1	1.1	0.00
16	1.9	1.4	0.74	0.54	0.41	0.29	0.22	0.18	1.8	0.98	1.0	0.00
17	1.9	0.95	0.73	0.50	0.40	0.30	0.22	0.18	1.9	0.88	0.95	0.00
18	2.0	0.94	0.73	0.51	0.39	0.29	0.22	0.17	1.8	0.83	0.88	0.00
19	2.0	0.97	0.73	0.51	0.39	0.30	0.22	0.14	1.7	0.86	0.88	0.00
20	1.9	0.97	0.72	0.51	0.39	0.28	0.21	0.12	1.8	0.70	0.84	0.00
21	1.9	1.0	0.69	0.51	0.39	0.29	0.20	0.11	1.7	0.62	0.85	0.00
22	1.6	1.0	0.67	0.50	0.39	0.31	0.20	0.11	1.8	0.56	0.81	0.00
23	1.1	0.92	0.65	0.49	0.39	0.29	0.20	0.14	2.1	1.9	0.75	0.00
24	1.8	0.89	0.64	0.49	0.39	0.27	0.20	0.14	2.3	6.1	0.71	0.00
25	1.0	0.85	0.64	0.49	0.38	0.25	0.20	0.12	2.5	5.5	0.70	0.00
26	0.42	0.84	0.64	0.49	0.38	0.25	0.20	0.13	2.5	5.3	0.72	0.00
27	0.39	0.84	0.62	0.49	0.37	0.26	0.19	0.16	2.5	4.8	0.68	0.00
28	0.73	0.84	0.62	0.49	0.37	0.26	0.19	0.15	2.5	4.2	0.69	0.00
29	1.5	0.84	0.62	0.49	---	0.26	0.20	e0.20	2.8	3.7	0.72	0.00
30	1.6	0.82	0.62	0.47	---	0.25	0.20	e0.40	3.0	3.3	0.62	0.00
31	1.5	---	0.60	0.46	---	0.24	---	e0.50	---	3.0	0.58	---
TOTAL	50.54	42.07	22.46	16.38	11.30	9.60	6.48	5.74	51.79	72.23	38.38	4.46
MEAN	1.63	1.40	0.72	0.53	0.40	0.31	0.22	0.19	1.73	2.33	1.24	0.15
AC-FT	100	83	45	32	22	19	13	11	103	143	76	8.8
MAX	2.4	2.2	0.81	0.59	0.46	0.37	0.25	0.50	3.0	6.1	2.9	0.74
MIN	0.39	0.82	0.60	0.46	0.37	0.24	0.19	0.10	0.70	0.56	0.58	0.00

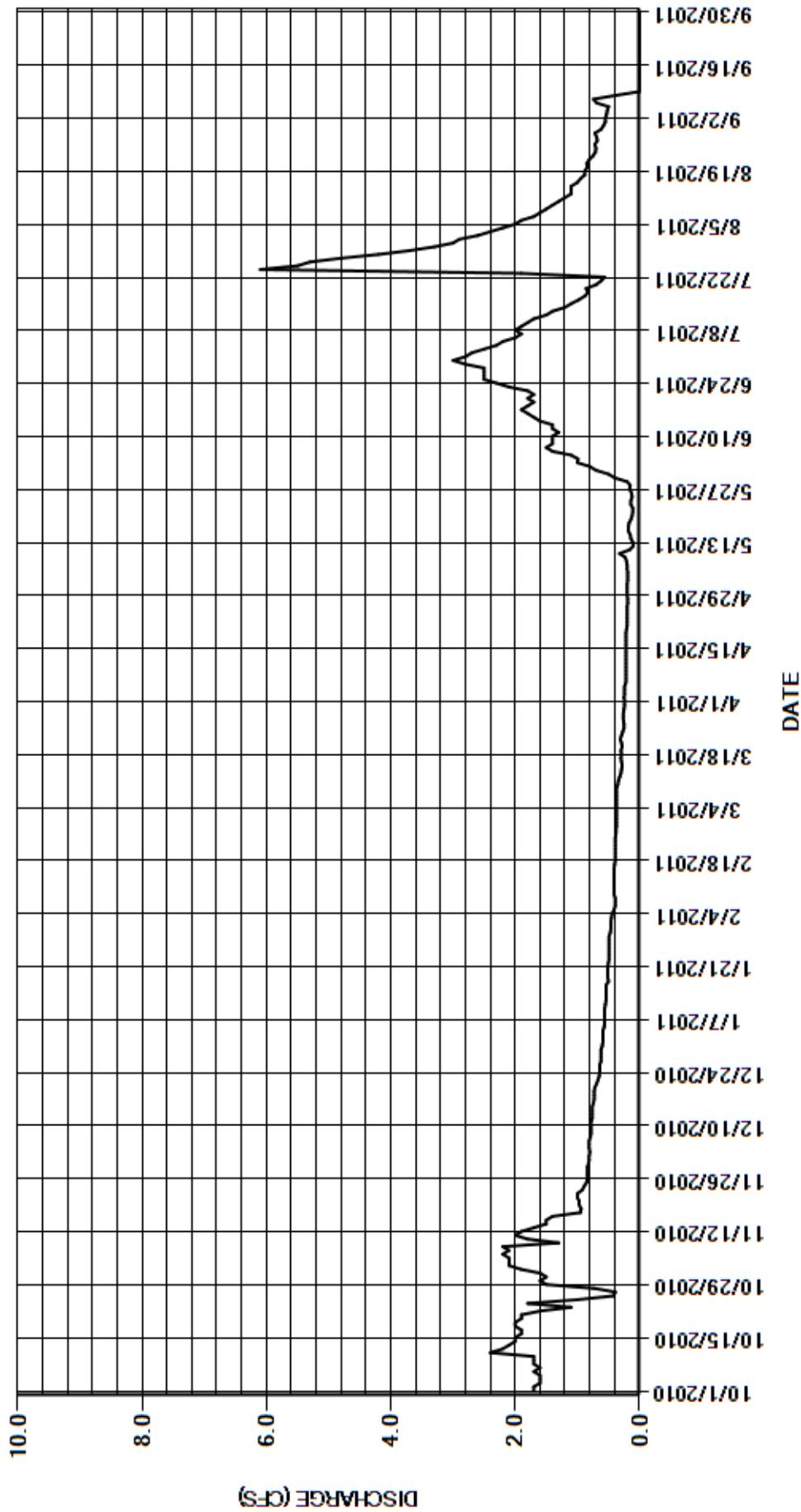
CAL YR	2010	TOTAL	1901.80	MEAN	5.21	MAX	34	MIN	0.29	AC-FT	3770
WTR YR	2011	TOTAL	331.43	MEAN	0.91	MAX	6.1	MIN	0.00	AC-FT	657

MAX DISCH: 6.98 CFS AT 18:00 ON JUL 26,2011 GH 1.71 FT SHIFT 0 FT

MAX GH: 2.38 FT AT 15:15 ON JUN 02,2011 (Ice affected)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06746000 MICHIGAN DITCH AT CAMERON PASS
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06746500 SKYLINE DITCH AT CHAMBERS LAKE
Water Year 2011

Location.--	Lat. 40°39'50", Long. 105°53'10" (datum unknown). Diverts water from West Branch Laramie River to Chambers Lake (tributary to Cache la Poudre River) in sec. 31, T.8 N., R.75 W.
Drainage Area and Period of Record.--	Transmountain diversion, diverting water from the West Branch of the Laramie River to Chambers Lake (tributary to the Cache la Poudre River). Daily values are available from October 13, 1922 to present.
Equipment.--	Weekly F-Type graphic water-stage recorded in a 6-foot by 6-foot timber shelter overtop a 3-foot by 3.5-foot concrete stilling well at a 10-foot Parshall flume. A drop tape and reference point serve as the primary reference and there are staff gages present in the flume and stilling well as supplemental references.
Hydrologic Conditions.--	
Gage-Height Record.--	There was no water run this water year. In previous year's, the primary record has been mean daily gage heights taken from the chart recorder. This is the only source. The charts are worked by the District 3 water commissioner and checked by hydrographer.
Datum Corrections.--	Drop tape length and RP elevation are tied to the average crest elevation of the flume. Levels were last run on June 6, 2000 and verified the correct tape length/RP elevation of 8.15 feet.
Rating.--	A standard Parshall flume rating STD10FTP is used. There was no water run this water year.
Discharge.--	
Special Computations.--	Shifts have been zero or adjusted to zero in the past.
Remarks.--	Record good. Record developed by Lee Cunning.
Recommendations.--	Levels to RP and flume staff gage should be run in Water Year 2012 if water is run through flume.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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06746500 SKYLINE DITCH AT CHAMBERS LAKE

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

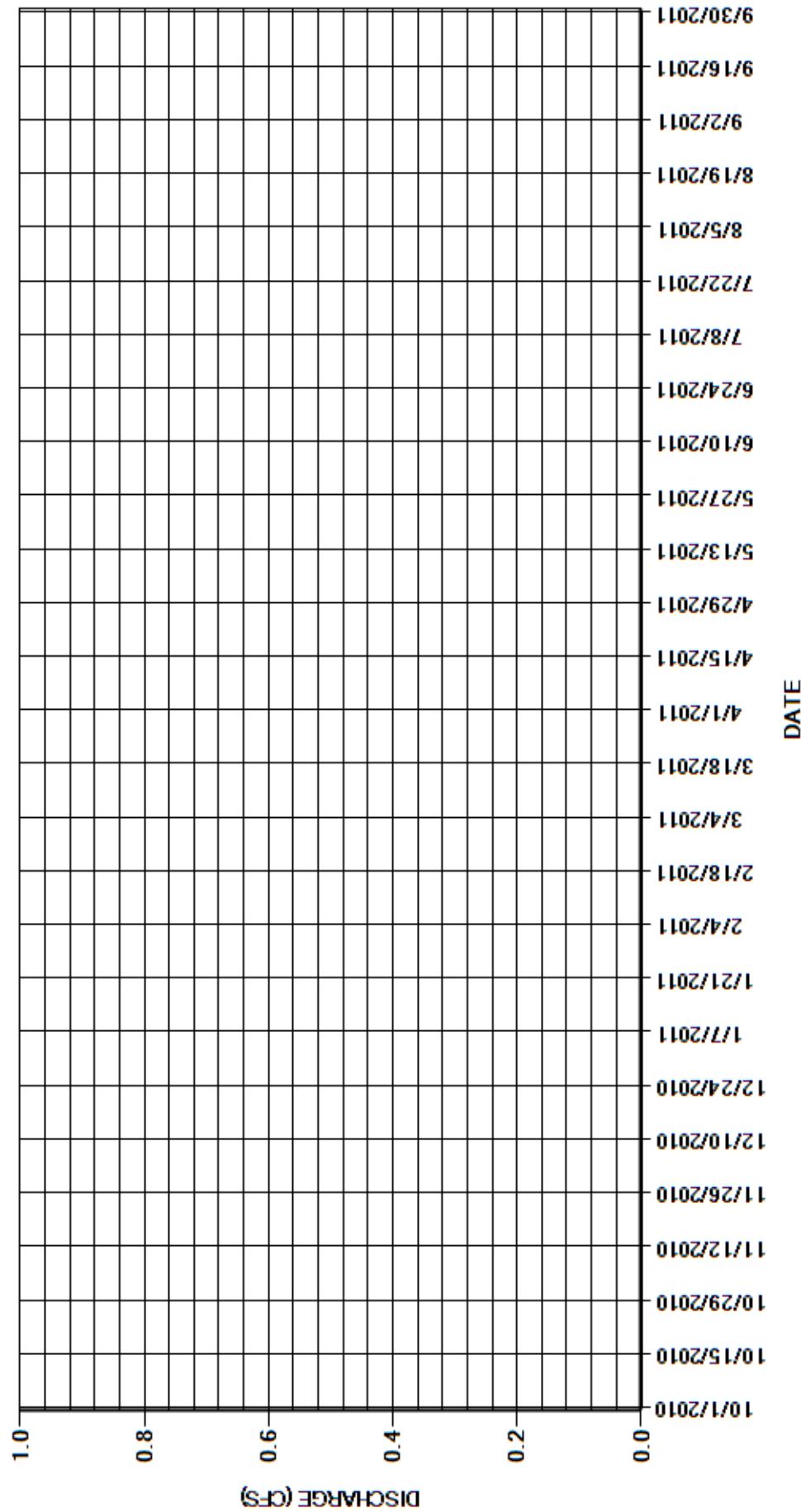
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AC-FT	0	0	0	0	0	0	0	0	0	0	0	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAL YR	2010	TOTAL	0.00	MEAN	0.000	MAX	0.00	MIN	0.00	AC-FT	0	
WTR YR	2011	TOTAL	0.00	MEAN	0.000	MAX	0.00	MIN	0.00	AC-FT	0	

MAX DISCH: (no water diverted in WY2011)

MAX GH: 0.00 FT (no water diverted in WY2011)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06746500 SKYLINE DITCH AT CHAMBERS LAKE
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
06747000 LARAMIE POUDRE TUNNEL @ 10 FT PARSHALL FLUME
Water Year 2011

Location.--	Lat. 40°40'34", Long. 105°50'49"; Laramie-Poudre tunnel diverts water from Laramie River and tributaries to Cache la Poudre River in sec 9, T.8 N., R.75 W.
Drainage Area and Period of Record.--	Trans-Mountain Diversion from the Laramie River Basin to the Poudre River Basin.
Equipment.--	Sutron 56-0540-400-DTR shaft encoder connected to a Sutron SatLink 2 data collection platform, F-type graphic water stage recorder as backup at a 10 foot Parshall flume. The gage is referenced with a drop tape from an IG reference point. There is also an outside staff gage.
Hydrologic Conditions.--	Extremely high levels of snow pack in the Spring put the Cache La Poudre River on 'free river' status and kept the Laramie Poudre Tunnel diversion flows low and intermittent until late July 2011. This is a much later start than normal and water was only diverted until September 13, 2011. The tunnel produced 15,590 acre-feet of the 19,875-foot "quota". The tunnel was turned on 'intermittently' to alleviate minor flooding conditions in the Laramie River Basin during runoff.
Gage-Height Record.--	Primary record is 15-minute satellite data with chart back up. The record is complete and reliable. Gage heights around 0.17 ft and below are residual after the Tunnel Diversion gate is shut and no flow is at the gage. These gage heights were reduced to zero.
Datum Corrections.--	Levels were last run on August 20, 2009. The gage was found to be reading correctly with respect to the flume crest.
Rating.--	The rating is a standard 10-ft Parshall Flume rating, STD10FTPEXP. It was used for the entire water year. One measurement of 61.8 cfs (No. 53) was made this year. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/- 5%) discharge measurement for a 10 ft Parshall Flume is 6 to 200 cfs. Anything above or below this range is outside the +/- 5% accuracy range, unless defined by measurements. The peak flow of 275 cfs occurred at 1700 August 1, 2011 at a gage height of 3.37 ft with a zero shift.
Discharge.--	Measurement 53 showed a shift of +0.04 ft but was discounted +4% to a zero shift. A zero shift has always been used at this gage, and was continued this year. However, the positive shift trend at this flume continued this year. A specialized flume rating or application of the positive shifts may need to be considered if this trend continues. Discharge was computed by direct application of the rating to the gage height record.
Special Computations.--	None.
Remarks.--	Record is good. Record developed by Lee Cunning.
Recommendations.--	The source of the positive shifts should be investigated. If the shifts are confirmed, then measurements should not be adjusted to zero. Spurious GH's during measurement due to hydrographer in flume should be documented in field notes. Levels should be run in Water Year 2012 to determine possible sources of shifts. Approach velocities and any other source of positive shifts should be checked out, and documented in future Station Analyses and Descriptions.

STATE OF COLORADO
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06747000 LARAMIE POUDRE TUNNEL @ 10 FT PARSHALL FLUME

RATING TABLE.-- STD10FTPFPF USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

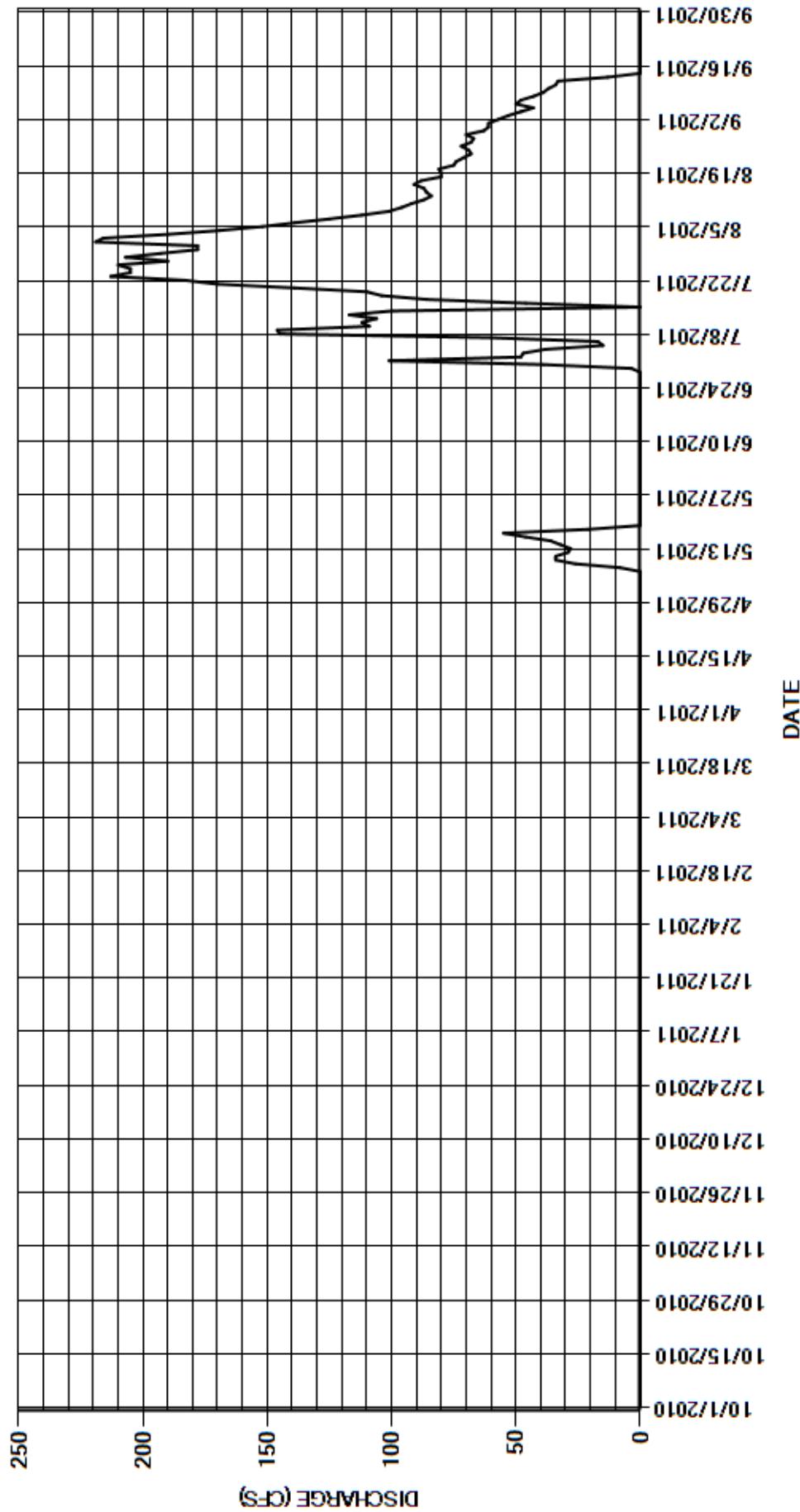
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	101	219	61
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	48	216	57
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	47	190	53
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	38	169	48
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15	152	43
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17	139	50
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	60	125	48
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e8.1	0.00	145	112	43
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e26	0.00	146	101	39
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34	0.00	109	96	37
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34	0.00	112	92	34
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29	0.00	106	87	33
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28	0.00	117	84	13
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32	0.00	100	86	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36	0.00	0.00	87	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	46	0.00	46	91	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	55	0.00	86	88	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21	0.00	104	80	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	110	80	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	139	81	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	170	75	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	183	74	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	213	71	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	205	68	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	205	69	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	210	72	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	190	68	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	207	67	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	193	70	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	39	178	63	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	178	61	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	349.10	42.50	3778.00	3133	559.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	11.3	1.42	122	101	18.6
AC-FT	0	0	0	0	0	0	0	692	84	7490	6210	1110
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	55	39	213	219	61
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	61	0.00
CAL YR	2010	TOTAL	5245.10	MEAN	14.4	MAX	209	MIN	0.00	AC-FT	10400	
WTR YR	2011	TOTAL	7861.60	MEAN	21.5	MAX	219	MIN	0.00	AC-FT	15590	

MAX DISCH: 275 CFS AT 17:00 ON AUG 01,2011 GH 3.37 FT SHIFT 0 FT

MAX GH: 3.37 FT AT 17:00 ON AUG 01,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06747000 LARAMIE POUDRE TUNNEL @ 10 FT PARSHALL FLUME
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
BOBCREEK DITCH NEAR DEADMAN MTN., NEAR GLENDEVEY
Water Year 2011

Location.--	Lat. N40° 45' 50", Long. W105° 45' 40" (Spotted from topographic map, NAD27). Gage is located on the left side of a 3-foot Parshall Flume 3 miles south of Deadman Hill and 9 miles SE of Glendevey, CO.
Drainage Area and Period of Record.--	Transmountain diversion, diverting water from Nunn Creek in the Laramie River Basin to Roaring Creek in the Cache la Poudre River Basin. Daily values are available from the DWR from May 1, 1940 to present.
Equipment.--	F-type graphic water-stage recorder and Sutron SDR-0001-1 shaft encoder in a metal shelter with stilling well at a 3-foot Parshall flume. A metal drop tape and reference point serve as the primary reference. A supplemental staff gage is present. Gage is owned, operated and maintained by the City of Greeley. Elevation of gage is 9,890 ft. (from topographic map).
Hydrologic Conditions.--	The snow pack in this area was way above normal this year. Due to cooler temperatures, above average snowpack and copius amounts of rainfall throughout the Spring runoff, the ditch was not turned on this water year. The Poudre River was on 'Free River' status into July.
Gage-Height Record.--	No water was run this Water Year.
Datum Corrections.--	Levels were run on October 7, 2004 tying the average crest height to a reference point on the shelf. A drop tape was made. The staff reads approximately 0.04 ft lower than the drop tape. The crest of the flume is nearly level (only about 0.01 ft change across the crest). There is a slight 'tilt' at the staff to the inlets of about 0.15 feet above the flume floor. The floor of the flume at the staff is about 0.04 feet higher causing the outside staff to read about 0.04 feet less than the drop tape.
Rating.--	Levels were ran on June 8, 2009. Flume crest and RP were found to be stable and reading correctly. Rating No. 1, a standard 3-foot Parshall flume rating table, is used.
Discharge.--	No water was run this Water Year.
Special Computations.--	None.
Remarks.--	Record good. Record developed by Lee Cunning.
Recommendations.--	None.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

BOBCREEK DITCH NEAR DEADMAN MTN., NEAR GLENDEVEY

RATING TABLE.-- STD03FTP1 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

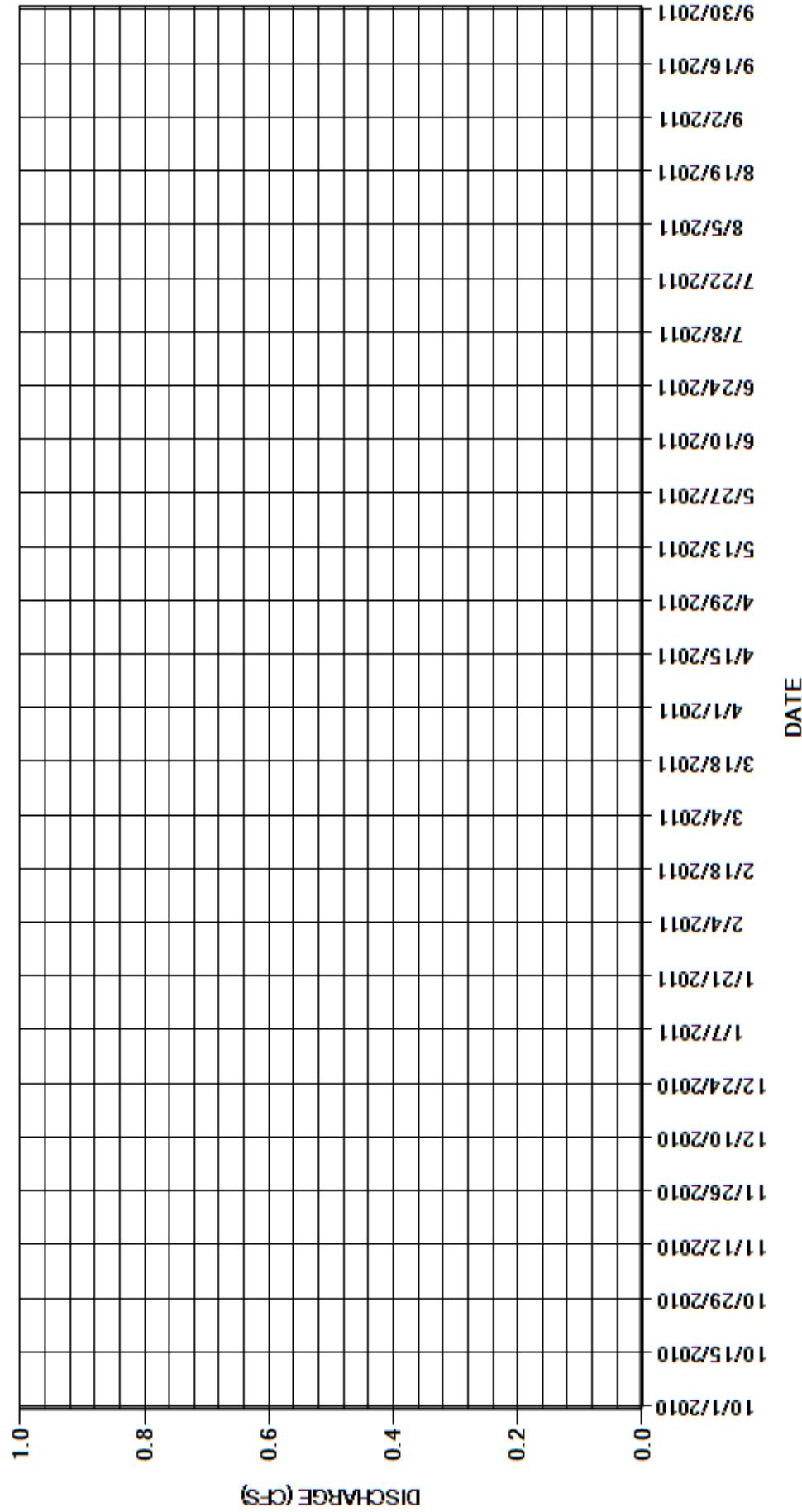
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AC-FT	0	0	0	0	0	0	0	0	0	0	0	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAL YR	2010	TOTAL	0.00	MEAN	0.000	MAX	0.00	MIN	0.00	AC-FT	0	
WTR YR	2011	TOTAL	0.00	MEAN	0.000	MAX	0.00	MIN	0.00	AC-FT	0	

MAX DISCH: (No water diverted in WY2011)

MAX GH: 0.00 FT (No water diverted in WY2011)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

BOBCREEK DITCH NEAR DEADMAN MTN., NEAR GLENDEVEY
WY2011 HYDROGRAPH



PLATTE RIVER BASIN
DEADMAN DITCH NEAR DEADMAN PARK
Water Year 2011

Location.--	Lat 40°50'04", long 105°48'05", sec. 9, T. 10 N., R. 75 W., Diverts water from Laramie River and tributaries, to Sheep Creek (tributary to Cache La Poudre River) via Sand Creek.
Drainage Area and Period of Record.--	N/A.
Equipment.--	Weekly graphic water-stage recorder and Sutron Stage Discharge Recorder (SDR) at a 6 foot Parshall flume. The recorder is in a steel shelter and the gage is referenced with an outside staff gage in the flume.
Hydrologic Conditions.--	Various entities plow the road into this site and scoop the snow out of the ditch.
Gage-Height Record.--	The primary record is 15-minute data taken from the SDR with the chart as backup. The Ditch was turned on June 17, 2011 at 15:10. The SDR was not installed until July 6, 2011 when Measurement 22 was made. The ditch was shut off on August 3, 2011. The record is complete and reliable, except for June 25 - 27, when the chart was not changed and no gage height data were collected. Chart record was used for the period before the SDR was installed without loss of accuracy.
Datum Corrections.--	Levels were last run across the crest of the flume on August 6, 2009. The gage was reading correctly at that time. A new Reference Mark (RM 2) was established on the right side footer of the downstream (D/S) wing-wall. The elevation established for RM 2 was 0.862 ft.
Rating.--	The control is a standard 6-ft Parshall Flume. A standard 6-ft Parshall flume rating, STD06FTPF, was used this year, and is defined for all ranges of flow experienced at the gage this year. One measurement of 9.74 cfs (No. 22) was made this year. Using the USBR Water Measurement Manual, Third Edition, Figure A8-12, the range of accurate (within +/-5%) discharge measurement for a 6 ft Parshall Flume is 2.63 to 103 cfs. Anything above or below this range is outside the +/-5% accuracy range, unless defined by measurements. The peak flow of 66.2 cfs occurred at 1245 June 20, 2011 at a gage height of 1.89 ft with a zero shift.
Discharge.--	All past measurements have shown a zero shift or discounted to zero shift. Discharge was computed by direct application of the rating to the period of gage height record.
Special Computations.--	The period June 25-27 was estimated using trends in good data on either side of the missing data.
Remarks.--	Record is good except for June 25 - 27 when no gage height record was recorded. Discharge for this period was estimated and is considered poor. The ditch was started up on June 17, 2011 and was shut off on August 3, 2011. The gage height record was worked by Lee Cunning and checked by the District 3 deputy water commissioner, Mark Simpson.
Recommendations.--	Re-check RM 2 with levels next water year.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

DEADMAN DITCH NEAR DEADMAN PARK

RATING TABLE.-- STD06FTP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

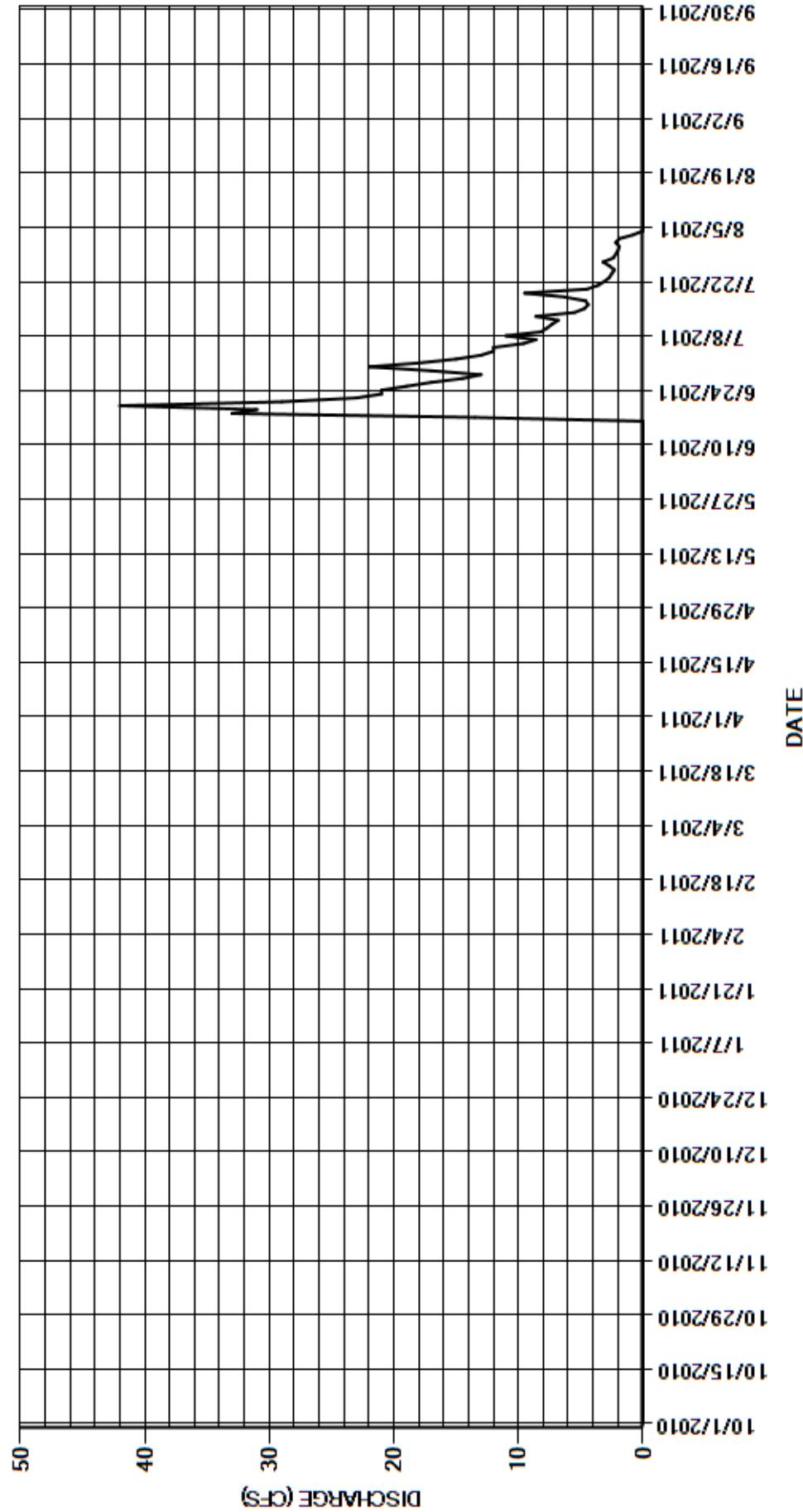
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18	2.2	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15	1.9	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13	0.78	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.6	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.6	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.2	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.7	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.3	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.8	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.6	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.5	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.7	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.4	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14	4.6	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33	6.3	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31	9.5	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	42	4.5	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29	3.6	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23	3.1	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21	2.7	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21	2.5	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e19	2.3	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e17	2.7	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e14	3.2	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13	2.4	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	17	2.2	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	22	2.0	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	1.9	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	316.00	205.9	4.88	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.5	6.64	0.16	0.000
AC-FT	0	0	0	0	0	0	0	0	627	408	9.7	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	42	18	2.2	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.9	0.00	0.00
CAL YR	2010	TOTAL	160.23	MEAN	0.44	MAX	8.2	MIN	0.00	AC-FT	318	
WTR YR	2011	TOTAL	526.78	MEAN	1.44	MAX	42	MIN	0.00	AC-FT	1040	

MAX DISCH: 66.2 CFS AT 12:45 ON JUN 20,2011 GH 1.89 FT SHIFT 0 FT

MAX GH: 1.89 FT AT 12:45 ON JUN 20,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

**DEADMAN DITCH NEAR DEADMAN PARK
WY2011 HYDROGRAPH**



PLATTE RIVER BASIN

06750500 WILSON SUPPLY DITCH NEAR EATON RESERVOIR @ 10 FT PARSHALL FLUME

Water Year 2011

Location.--	Lat. N40° 54' 26", Long. W105° 46' 47" (NAD83) in the Cache la Poudre River Basin.
Drainage Area and Period of Record.--	Transmountain diversion, diverting water from Sand Creek and Deadman Creek in the Laramie River Basin to Sheep Creek in the Cache la Poudre River Basin. Data is available from the USGS (WSP 1310) from October 1912 to September 1947. Daily values are available from the DWR from May 1, 1933 to present.
Equipment.--	F-Type graphic water-stage recorder and a Sutron 56-0540-400-DTR shaft encoder connected to a satellite monitored data collection platform in a 42-inch corrugated metal pipe shelter overtop a 2.50-foot square concrete stilling well at a 10-foot Parshall flume. A metal drop tape and an adjustable reference point are the primary reference. A supplemental staff gage is present but set too deep in the flume's converging section
Hydrologic Conditions.--	Regulated diversion. This was an above average year for snow-pack. The ditch started May 16 and turned off August 2. A couple small rain events were caught on August 4 and 20.
Gage-Height Record.--	The primary record is 15-minute satellite data with chart record as backup. The record is complete and reliable. The chart was stated on May 16, 2011 by the Ditch Rider and the satellite equipment was brought online by Mark Simpson at the same time; however, the shaft encoder was not calibrated correctly at this time. On May 18th the shaft encoder was adjusted +0.08 ft to match the primary reference. An instrumentation correction was applied for the period as defined by observations. The gage was visited twice during the season by a hydrographer and was found to be reading accurately both visits. A tree became lodged in the flume on May 25 and was removed on May 26, 2011. Both satellite data and chart record showed that the stage was elevated (backwater) by 0.06 ft. during this period.
Datum Corrections.--	Levels were last run Aug 6, 2009 across the crest of the flume to the IG. The tape was found to be reading accurately. A new Reference Mark (RM 2) was established on the top of the downstream right wing wall, Elevation = 3.948 ft.
Rating.--	The control is a 10-foot Parshall flume. A standard 10-foot Parshall flume rating was continued again this year. One discharge measurement (No. 23) was made during the year at a discharge rate of 49.1 cfs. The peak discharge of 122 cfs occurred at 1600 June 20, 2011 at a gage height of 2.03 ft with a shift of 0.00 ft.
Discharge.--	This year's measurement and previous year's measurements do not show signs of permanent shifting conditions. Historically, measurements within +/-5% of the rating have been adjusted to the rating. As such, this year's measurement was adjusted 1% to the rating. The rating was applied to the gage-height record to compute discharge, except for the backwatered period listed above.
Special Computations.--	None.
Remarks.--	The record is good except for the backwatered period which is considered fair. The peak event of June 20, 2011 is considered good. Water was run from May 16, 2011 until August 2, 2011 when the ditch was shut off. Gage maintained by Mark Simpson and Lee Cunning. Record developed by Lee Cunning.
Recommendations.--	Levels should be run in the 2012 Water Year. Measurement opportunities at low, mid. and high flow rates should be watched for.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06750500 WILSON SUPPLY DITCH NEAR EATON RESERVOIR @ 10 FT PARSHALL FLUME

RATING TABLE-- STD10FTPFP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

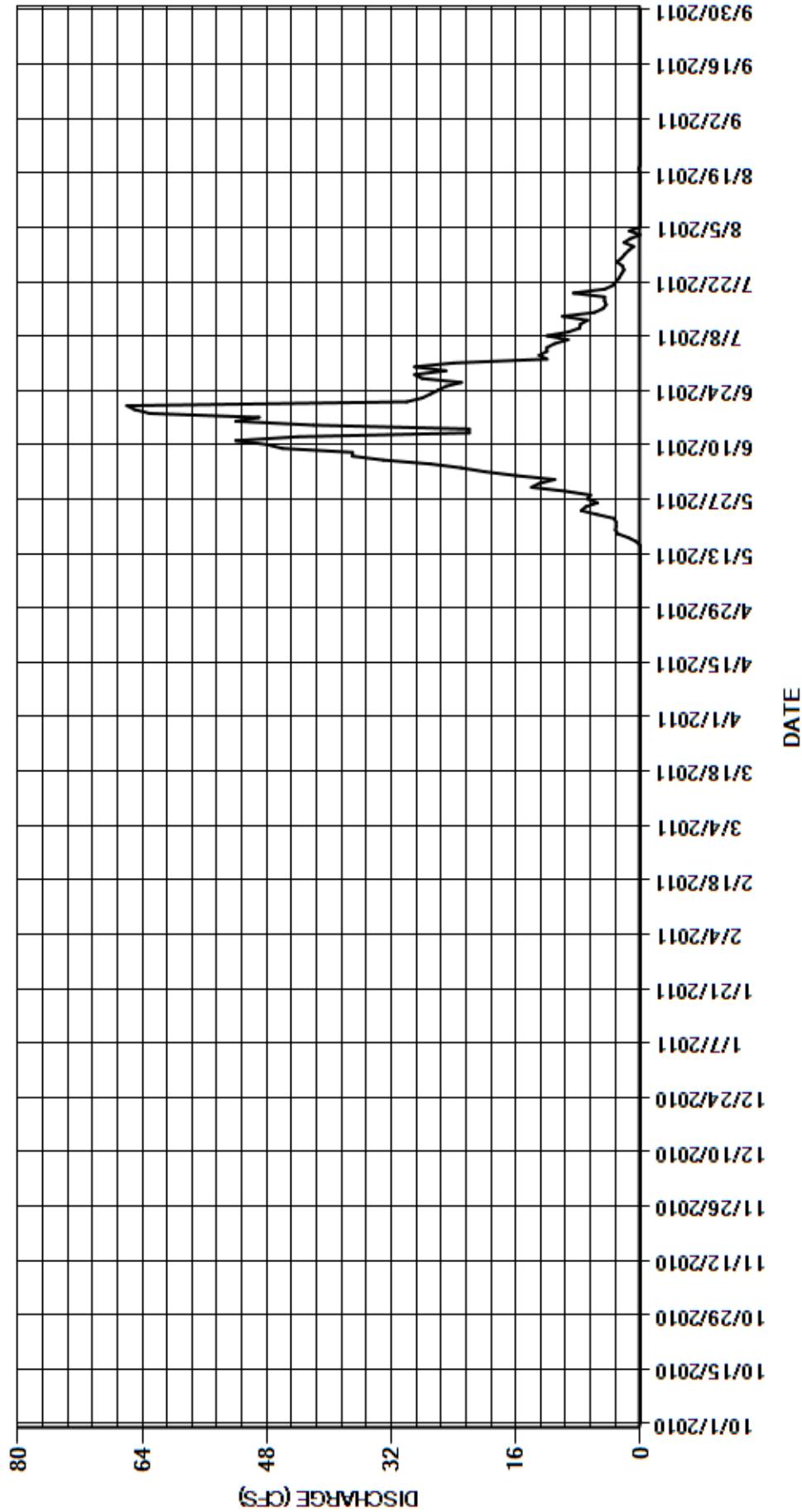
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11	24	2.1	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16	12	1.3	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20	13	0.04	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23	12	1.4	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27	12	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33	11	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37	9.3	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37	12	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	46	9.2	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	48	7.8	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	52	7.7	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	44	6.8	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22	10	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22	5.9	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	42	4.8	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.53	52	4.4	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.5	49	4.6	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.9	63	4.6	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.2	65	8.6	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.1	66	4.6	0.18	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.1	30	3.5	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.4	28	3.1	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.6	27	2.7	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.6	26	2.4	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e7.0	25	2.1	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e5.5	23	2.3	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.8	28	3.0	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.4	29	2.4	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	9.7	25	2.0	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	14	29	1.5	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	13	---	0.86	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	93.33	1045	210.16	5.02	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.01	34.8	6.78	0.16	0.000
AC-FT	0	0	0	0	0	0	0	185	2070	417	10	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14	66	24	2.1	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11	0.86	0.00	0.00
CAL YR	2010	TOTAL	675.67	MEAN	1.85	MAX	46	MIN	0.00	AC-FT	1340	
WTR YR	2011	TOTAL	1353.51	MEAN	3.71	MAX	66	MIN	0.00	AC-FT	2680	

MAX DISCH: 122 CFS AT 16:00 ON JUN 20,2011 GH 2.03 FT SHIFT 0 FT

MAX GH: 2.03 FT AT 16:00 ON JUN 20,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06750500 WILSON SUPPLY DITCH NEAR EATON RESERVOIR @ 10 FT PARSHALL FLUME
WY2011 HYDROGRAPH



REPUBLICAN RIVER BASIN

PIONEER DITCH

Water Year 2011

Location.--	Lat. 40°05'05", Long. 102°08'30", SW¼NE¼ sec. 2, T.1 N., R.43 W., Yuma County, 4 mi east of Wray, Co., 1000 ft south of U.S. Highway 34.
Drainage Area and Period of Record.--	N/A
Equipment.--	Weekly graphic water stage recorder and Sutron shaft encoder connected to a Sutron SatLink I Satellite Monitoring Data Collection Platform (DCP) in a metal box enclosure and well section at a 5 -foot Parshall flume in a concrete lined canal. The canal is equipped with a timber suspended in the flow upstream of the gage to slow down velocities into the flume. The primary reference gage is an outside staff gage in the flume.
Hydrologic Conditions.--	The Pioneer Ditch is a controlled diversion from North Fork of the Republican River, which is derived from underground sources and sand hill plains storm runoff. Diversion is regulated by obligations to the states of Kansas and Nebraska under the Republican River Compact .
Gage-Height Record.--	The primary record is telemetered 15-minute shaft encoder data with chart record as backup. The record is complete and reliable. The gage is a seasonal gage. The gage was shut off on November 15, 2010 for the winter. On April 13th, 2011 State of Colorado personnel set the chart and turned the satellite telemetry back on. Both chart and shaft encoder was set to 0.00 ft. The record is supported by calibration visits recorded on visit sheets. An encoder correction of +0.09 ft was applied to the record without loss of accuracy when the flow was started in April. Six other adjustments ranging from -0.01 ft to +0.02 ft were applied to the record for short periods. Encoder corrections of +/-0.01 ft were applied this year, but could be ignored if appropriate since the outside staff is read as the primary reference. A residual non-zero gage height is typically seen due mud in the well after the water is turned off. This year gage heights below about 0.13 ft were considered zero flow. The canal was off on the following days: October 15, 2010 to April 28, 2011, May 27-30, 2011, July 3-5, 2011.
Datum Corrections.--	Levels were last run to the crest of the flume on May 9, 2011. The crest was found to be an average of 0.027 ft higher than the staff zero point. This would account for about 0.02 ft of the negative shift seen on the flume. No correction was made to the staff.
Rating.--	The concrete canal is trapezoidal and has a concave transition to the flume. (This is opposite the traditional modified Parshall transition.) The canal was originally dirt, and when it was lined the flume approach velocities greatly increased. A timber was suspended in the flow above the flume to dissipate energy. Accumulation of weeds and trash on the timber has caused unpredictable velocity variations across the flume. The canal is straight above and below the flume. Submergence is not a problem. Control is a 5-foot steel Parshall Flume. A standard 5- foot Parshall Flume rating, STD05FTPF, was used again this year. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/-5%) discharge measurement for a 5 ft Parshall Flume is 1.56 to 85.6 cfs. Anything above or below this range is outside the +/- 5% accuracy range, unless defined by measurements. In 2011 no days had flows recorded outside the defined range. Colorado Water Resources and Nebraska Natural Resources personnel made thirteen measurements (Nos. 712 – 724) during the 2011 water year. They ranged in discharge from 7.71 to 24.3 cfs. The peak flow of 29.2 cfs occurred at 0715 June 20, 2011 at a gage height of 1.29 ft with a shift of -0.02 ft. It exceeded Measurement no. 717, made June28, 2011 by 0.14 ft in stage.
Discharge.--	Shifting control method was used the entire year. Approach velocities cause shifts. Trash on the timber above the gage visibly affected flow distribution in the flume and could account for some variability in the shifts. Moss and sediment in the canal can also have some slight effects on the flume. Given the variability of approach conditions over time, time shifting is used. Measurements show unadjusted shifts varying between -0.01 and -0.07 feet. Shift adjustments are made to average out shifts, since a particular shift may be transitory. Straight time shifting was used with no consideration to stage, since stage effects would be due to control changes and the control is not changing here—only the approach conditions. Measurements, No 713, 719, 721, and 725 made by Nebraska all were not used. They were not used due to any or all of the following reasons: inconsistency in width, depth, angle coefficient, and velocities. By agreement all measurements are made at an angle iron brace 6.0 ft. in width at the staff cross section. Measured depths are usually quite close to the staff GH, which gives a reasonable check on depths. Velocities are compared with Colorado measurements that are close in time and at similar GH. Two of the remaining ten measurements made were adjusted, to even the shifts out to a -0.02 ft or -0.03 shifts for most of the year. Measurement No.722 was adjusted 2.7% and measurement No. 715 (Nebraska) which was adjusted -8.9% since it was a poor measurement in terms of maximum discharge per section, inconsistent depths compared to staff, and angle coefficient.
Special Computations.--	State of Colorado personnel measured with a custom rated Mag-Head Pygmy meter, taking 21 depths and velocities across the flume at 0.30 ft. intervals. Nebraska Natural Resources personnel used a standard rating AA meter, taking 13 sections at 0.5 ft intervals.
Remarks.--	The record is good. Station maintained and record developed by Devin Ridnour.

Recommendations.--

Do not make encoder or pen corrections when the ditch is off and the floats are bottomed out. Make sure the encoder and pen floats are clear of each other and the well cylinder. Cooperation between the Colorado Hydrographer/Water Commissioner and Nebraska personnel has been helpful in arriving at consistent measurement techniques at this flume. Nebraska's spin times could be documented better. At the start of next season we should meet with Nebraska and ask them to write on our visit sheets and compare notes on technique. The pygmy meter should always be used at this flume, but if one State uses it and the other does not, then there may be problems with shifts.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

PIONEER DITCH

RATING TABLE.-- STD05FTP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

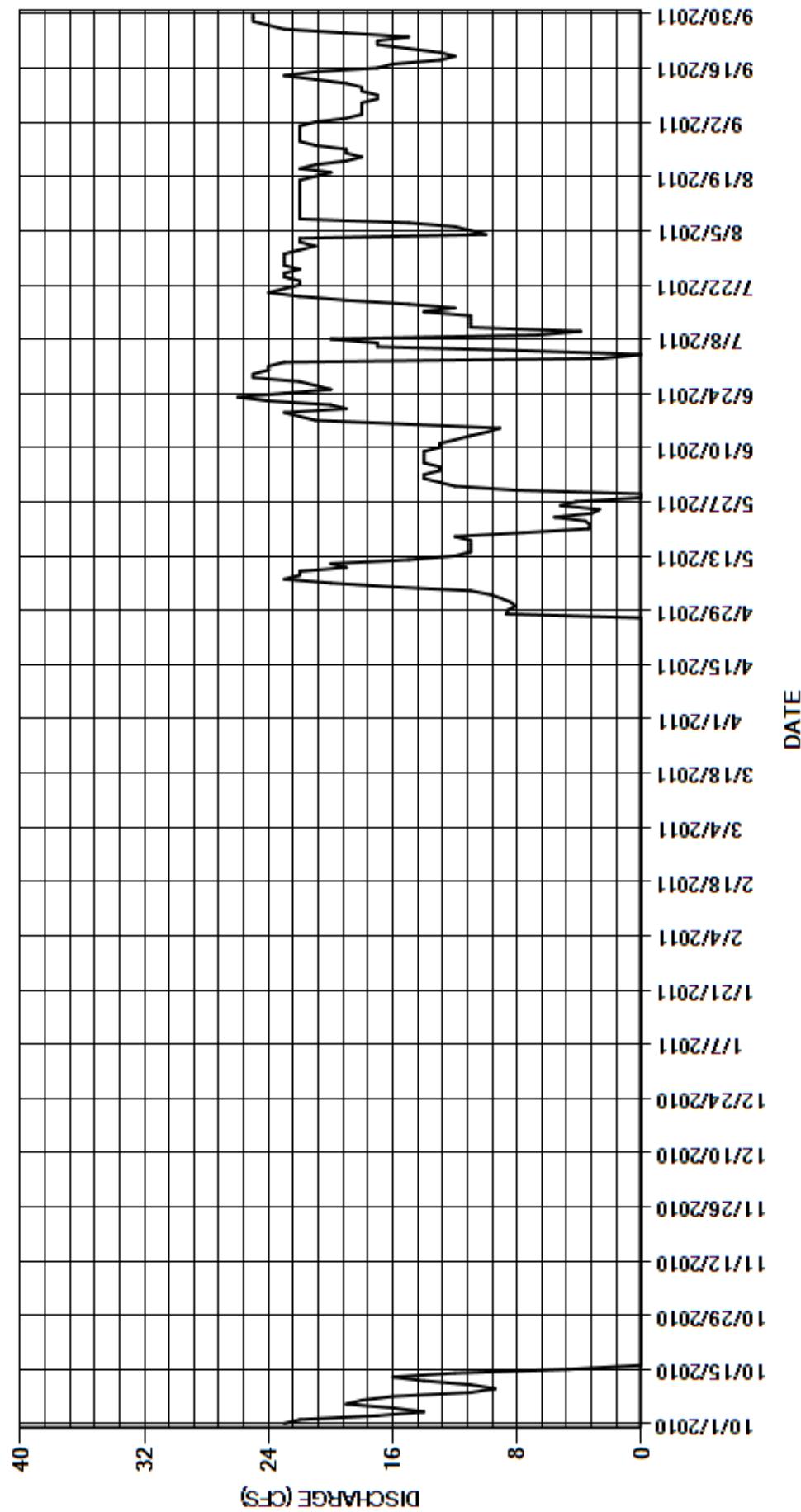
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	23	0.00	0.00	0.00	0.00	0.00	0.00	8.4	13	24	21	22
2	22	0.00	0.00	0.00	0.00	0.00	0.00	9.0	14	23	22	21
3	17	0.00	0.00	0.00	0.00	0.00	0.00	9.7	14	2.5	22	19
4	14	0.00	0.00	0.00	0.00	0.00	0.00	11	13	0.00	10	18
5	16	0.00	0.00	0.00	0.00	0.00	0.00	16	13	7.5	11	18
6	19	0.00	0.00	0.00	0.00	0.00	0.00	20	14	17	12	18
7	18	0.00	0.00	0.00	0.00	0.00	0.00	23	14	17	15	18
8	16	0.00	0.00	0.00	0.00	0.00	0.00	22	14	20	22	17
9	11	0.00	0.00	0.00	0.00	0.00	0.00	22	14	6.7	22	17
10	9.4	0.00	0.00	0.00	0.00	0.00	0.00	19	13	3.9	22	18
11	11	0.00	0.00	0.00	0.00	0.00	0.00	20	13	11	22	18
12	14	0.00	0.00	0.00	0.00	0.00	0.00	15	12	11	22	19
13	16	0.00	0.00	0.00	0.00	0.00	0.00	12	11	11	22	21
14	12	0.00	0.00	0.00	0.00	0.00	0.00	11	9.9	11	22	23
15	4.7	0.00	0.00	0.00	0.00	0.00	0.00	11	9.1	14	22	21
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11	15	12	22	17
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11	21	15	22	16
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12	22	19	22	13
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.6	23	22	21	12
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.4	19	24	20	13
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.3	20	23	22	15
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.6	24	22	21	17
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.6	26	22	19	17
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.2	23	23	18	15
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.7	20	23	19	19
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.2	21	22	19	23
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.2	22	23	21	24
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.7	0.00	25	23	25
29	0.00	0.00	0.00	0.00	---	0.00	8.6	0.00	25	23	22	25
30	0.00	0.00	0.00	0.00	---	0.00	8.1	8.2	24	23	22	25
31	0.00	---	0.00	0.00	---	0.00	---	12	---	22	22	---
TOTAL	223.10	0.00	0.00	0.00	0.00	0.00	25.40	322.10	521.0	520.60	623	564
MEAN	7.20	0.000	0.000	0.000	0.000	0.000	0.85	10.4	17.4	16.8	20.1	18.8
AC-FT	443	0	0	0	0	0	50	639	1030	1030	1240	1120
MAX	23	0.00	0.00	0.00	0.00	0.00	8.7	23	26	24	22	25
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.1	0.00	10	12
CAL YR	2010	TOTAL	2914.40	MEAN	7.98	MAX	27	MIN	0.00	AC-FT	5780	
WTR YR	2011	TOTAL	2799.20	MEAN	7.67	MAX	26	MIN	0.00	AC-FT	5550	

MAX DISCH: 29.2 CFS AT 07:15 ON JUN 20,2011 GH 1.29 FT SHIFT -0.02 FT

MAX GH: 1.29 FT AT 07:15 ON JUN 20,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PIONEER DITCH
WY2011 HYDROGRAPH



REPUBLICAN RIVER BASIN
PIONEER DITCH AT THE COLORADO-NEBRASKA STATELINE
Water Year 2011

Location.--	Lat. 40°03'25", Long. 102°03'10", SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 10, T.1 N., R.42 W., Yuma County; 1200 ft south of U.S. Highway 34 at Colorado/Nebraska State line.
Drainage Area and Period of Record.--	N/A.
Equipment.--	Weekly graphic water stage recorder and Sutron shaft encoder connected to a Sutron SatLink I Satellite Monitoring Data Collection Platform (DCP) in a metal box enclosure and well section at a 4 -foot Parshall flume. The site has two outside vertical enameled steel staffs (Ha-Hb, with the Hb staff set with 4.0 ft = 0.0). The Ha staff is the primary reference gage.
Hydrologic Conditions.--	The Pioneer Ditch is a controlled diversion from North Fork of the Republican River, which is derived from underground sources and sand hill plains storm runoff. This gage measures water delivered to Nebraska under the Republican River Compact. Heavy rains and some natural springs will cause flows to show up at the flume when the headgate is off. During the winter months an earth dam is in place to let the natural springs flow to the North Fork Republican River.
Gage-Height Record.--	The primary record is telemetered 15-minute shaft encoder data with chart record as backup. The record is complete and reliable. Recorded gage heights less than 0.05 feet were considered zero feet due to the float being beached on the mud in the stilling well. If it is noted the ditch was off on visit logs and some residual GH's were between 0.00 and 0.05, then flow was considered zero. Ditch was off for the following periods of time: October 16, 2010 through April 27, 2011 (off for winter); May 29, 2011. Seventeen encoder adjustments were applied using water commissioner visits to support the proration. The corrections ranged from +/- 0.05 ft.
Datum Corrections.--	Levels were last run to the crest of the flume on May 9, 2011. The flume was found to be out of level laterally, with the right side (stilling well intake side) found to be about 0.07 ft lower than the left (staff gage side). This accounts for a part of the positive shifts being measured. No correction was made to the staff.
Rating.--	The control is a 4-foot steel Parshall Flume with concrete sidewalls in a earthen canal. A standard 4-foot Parshall Flume rating table, STD04FTPF, was used this water year. Heavy vegetation builds up on the sides and bottom of the ditch and projects into the flume and narrows the approach. Vegetative growth downstream can also cause submergence. A positive shift can arise from the tilt and the slightly warped geometry of the flume. Encroachment of the flume wing walls into the flume entrance section and the resulting turbulence wake also is contributing to the positive shift and may also cause variability in staff gage readings and/or the need for gage height corrections to the shaft encoder. Using the USBR Water Measurement Manual, Third Edition, Figure 8-9, Page 8-44, the range of accurate (within +/- 5%) discharge measurement for a 4 ft Parshall Flume is 1.26 to 67.9 cfs. Anything above or below this range is outside the +/- 5% accuracy range, unless defined by measurements. No flows occurred outside this range in WY 2011. Colorado/Nebraska Water Resources personnel made thirteen measurements (Nos. 711–723) during the 2011 water year. They ranged in discharge from 2.96 to 21.4 cfs. The peak flow of 22.8 cfs occurred at 1115 June 23, 2011 at a gage height of 1.18 ft with a shift of +0.07 ft. The peak exceeded Measurement No. 716 made June 28, 2011 by 0.04 ft in stage.
Discharge.--	Shifting section control method was used for the year. Measurements for good record show shifts varying between +0.05 and + 0.11 feet. Shifts were distributed by time proration. Most shifts were adjusted to smooth distribution. Of the 13 measurements, 6 were discounted up to +/- 6%.
Special Computations.--	The record is compared with Pioneer Ditch at the Headgate figures to make sure no Stateline flows are inconsistent with the amounts diverted above. Daily flows greater at Stateline only occurred as a result of time delays when flow was dropping at the headgate, or due to rain events causing runoff into the ditch between the two gages.
Remarks.--	This is a seasonal gage used for the Republican River Compact. Station maintained and record developed by Devin Ridnour.
Recommendations.--	Do not make encoder or pen corrections when the ditch is off and the floats are bottomed out. Make sure the encoder and pen floats are clear of each other and the well cylinder.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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PIONEER DITCH AT THE COLORADO-NEBRASKA STATELINE

RATING TABLE.-- STD04FTP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

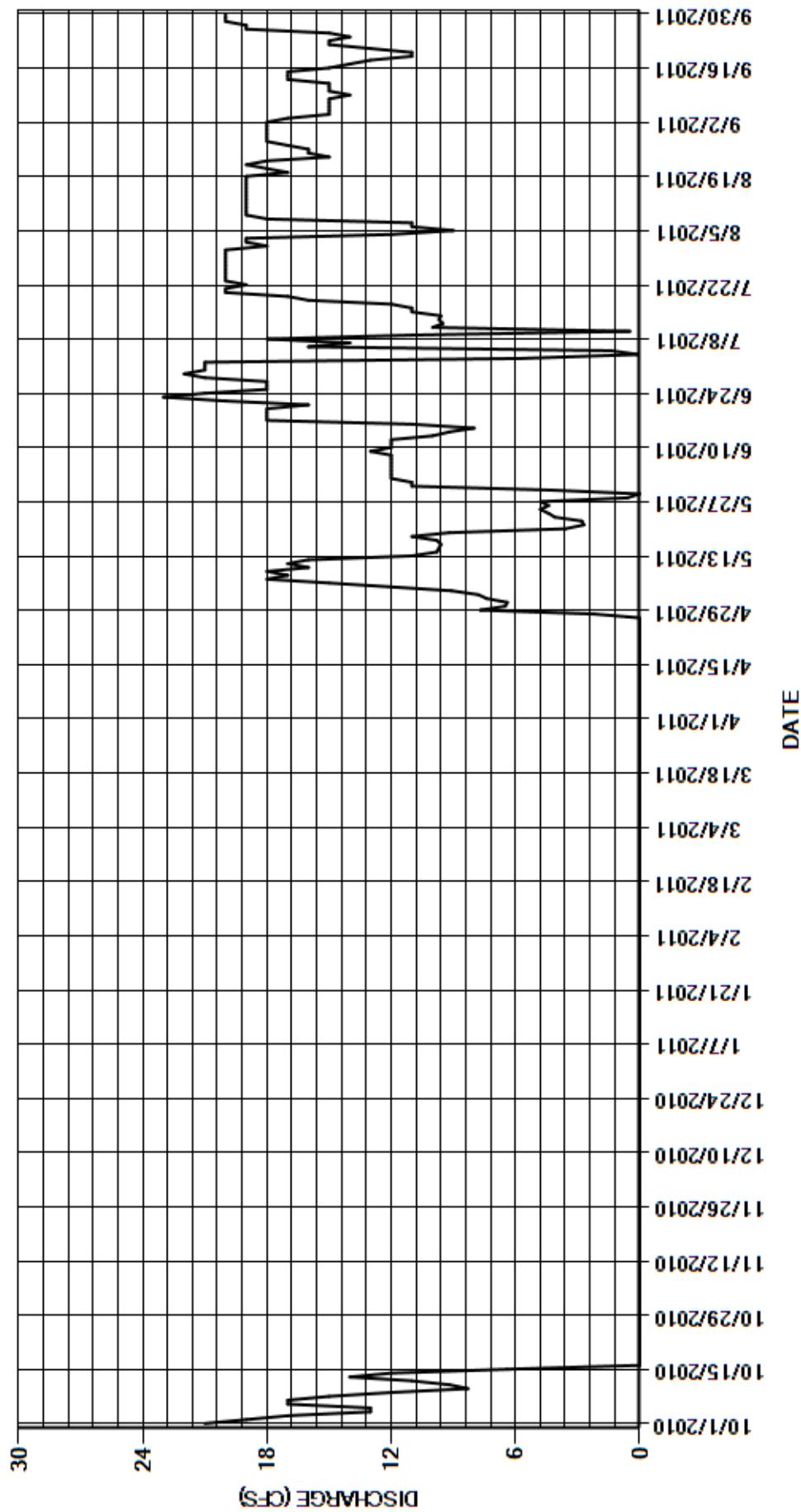
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	21	0.00	0.00	0.00	0.00	0.00	0.00	6.4	11	21	18	18
2	19	0.00	0.00	0.00	0.00	0.00	0.00	7.4	12	21	19	18
3	17	0.00	0.00	0.00	0.00	0.00	0.00	7.8	12	5.7	19	17
4	13	0.00	0.00	0.00	0.00	0.00	0.00	9.1	12	0.07	12	15
5	13	0.00	0.00	0.00	0.00	0.00	0.00	12	12	1.4	9.0	15
6	17	0.00	0.00	0.00	0.00	0.00	0.00	15	12	16	11	15
7	17	0.00	0.00	0.00	0.00	0.00	0.00	18	12	14	11	15
8	15	0.00	0.00	0.00	0.00	0.00	0.00	17	12	18	18	15
9	12	0.00	0.00	0.00	0.00	0.00	0.00	18	13	11	19	14
10	8.3	0.00	0.00	0.00	0.00	0.00	0.00	16	12	0.48	19	15
11	9.2	0.00	0.00	0.00	0.00	0.00	0.00	17	12	10	19	15
12	11	0.00	0.00	0.00	0.00	0.00	0.00	16	12	9.5	19	15
13	14	0.00	0.00	0.00	0.00	0.00	e0.00	11	10	9.7	19	17
14	12	0.00	0.00	0.00	0.00	0.00	0.00	9.8	9.2	9.6	19	17
15	6.4	0.00	0.00	0.00	0.00	0.00	0.00	9.7	8.0	11	19	17
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.6	11	11	19	15
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.8	18	12	19	14
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11	18	16	19	13
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.2	18	17	19	11
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.6	18	20	17	11
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.7	16	20	18	13
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.8	20	19	19	15
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.1	23	20	18	15
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.4	21	20	15	14
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.8	18	20	16	15
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.4	18	20	16	19
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.8	18	20	17	19
28	0.00	0.00	0.00	0.00	0.00	0.00	2.2	0.59	21	20	18	20
29	0.00	0.00	0.00	0.00	---	0.00	7.7	0.00	22	20	18	20
30	0.00	0.00	0.00	0.00	---	0.00	6.5	4.3	21	20	18	20
31	0.00	---	0.00	0.00	---	0.00	---	11	---	20	18	---
TOTAL	204.90	0.00	0.00	0.00	0.00	0.00	16.40	277.29	452.2	453.45	534.0	472
MEAN	6.61	0.000	0.000	0.000	0.000	0.000	0.55	8.94	15.1	14.6	17.2	15.7
AC-FT	406	0	0	0	0	0	33	550	897	899	1060	936
MAX	21	0.00	0.00	0.00	0.00	0.00	7.7	18	23	21	19	20
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.0	0.07	9.0	11	
CAL YR	2010	TOTAL	2541.20	MEAN	6.96	MAX	23	MIN	0.00	AC-FT	5040	
WTR YR	2011	TOTAL	2410.24	MEAN	6.60	MAX	23	MIN	0.00	AC-FT	4780	

MAX DISCH: 22.8 CFS AT 11:15 ON JUN 23,2011 GH 1.18 FT SHIFT 0.07 FT

MAX GH: 1.18 FT AT 11:15 ON JUN 23,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PIONEER DITCH AT THE COLORADO-NEBRASKA STATELINE
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
07082500 LAKE FORK CREEK BELOW SUGAR LOAF DAM NEAR LEADVILLE
Water Year 2011

Location.--	Lat. 39°15'05", Long. 106°22'28", Lake County, SE 1/4 NW 1/4 NW 1/4 sec. 19, T. 9 S., R. 80 W., on right bank 4.2 miles upstream from junction of Lake Fork Creek and Arkansas River.
Drainage Area and Period of Record.--	27.55 sq. mi.
Equipment.--	Satellite-monitored data collection platform including a shaft encoder and a Stage Discharge Recorder for backup purposes. The gage is constructed from a 42-inch diameter corrugated metal pipe CMP and concrete well. Shaft encoder and SDR are set to inside electric tape gage mounted on instrument shelf. An outside staff gage is also used for reference purposes. Shelter is equipped with AC power for the well heater. Control is a concrete weir/apron tapered lower from left to right bank, located at gage. The ET broke on Sept 28, 2011 and has not been repaired or replaced. The OG is being used as the primary reference gage.
Hydrologic Conditions.--	This gage is located approximately 500 ft from the discharge gates of Sugar Loaf Dam on Turquoise Reservoir. During winter months the flow comes from the gates of the dam and runs through and below the very large boulders in the stream bed and surfaces just before the gage. The water released is warm enough the control does not experience ice affected days. The well is also kept thawed with small tank heater during the winter months.
Gage-Height Record.--	The primary record is 15-minute satellite data. SDR record is used for back-up purposes. Record is complete and reliable.
Datum Corrections.--	Levels were last run on May 31, 2007, from BM#3 to the RP. No corrections were needed.
Rating.--	The control is a 38-ft. wide, concrete weir/apron with ogee lip. Rating No. 4A, dated Oct. 1, 1975, was used all water year. It is well defined to about 350 cfs. Three discharge measurements (Nos. 570-572) ranging from 15.7 cfs to 261 cfs were made this water year. They cover the range in stage experienced, except for the higher daily flows Jun 26-28, Jul 1, 2, 4-19, 2011; and the lower daily flows of Oct 1 - Dec 31, 2010; Jan 1 - May 13, 20-31, June 1, 2, 4, 5; Aug 2-14, 23, 31; Sep 1-30, 2011. The peak flow of 395 cfs occurred at 1515 on July 11, 2011 at a gage height of 1.99 ft with a shift of 0.01 ft. It exceeded the stage of maximum discharge Measurement No.571 made June 30, 2011 by 0.31 ft.
Discharge.--	Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and distributed by stage and time. Variable stage-shift relationship LFCBSLCOVS11B was used to distribute shifts by stage. This shift curve is based on historical measurements and current water year measurements. Measurement 572 was discounted 3.16% to fit the variable stage shift relationship.
Special Computations.--	
Remarks.--	Record is complete and is considered good. The peak discharge and gage height are rated good based on a related measurement and site visit. Station maintained and record developed by Cheston Hart.
Recommendations.--	Levels need to be run in WY2012 to verify the PZF and previous levels, as level history indicates a correction to the ET index elevation may be warranted. Once this has been accomplished, the rating should be evaluated for possible revision as the average rating error for an eleven year period is over 12%. High water measurements cannot be made at this gage at this time. A bank operated cable way installation should be further investigated.

STATE OF COLORADO
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07082500 LAKE FORK CREEK BELOW SUGAR LOAF DAM NEAR LEADVILLE

RATING TABLE-- LFCBSLCO04A USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

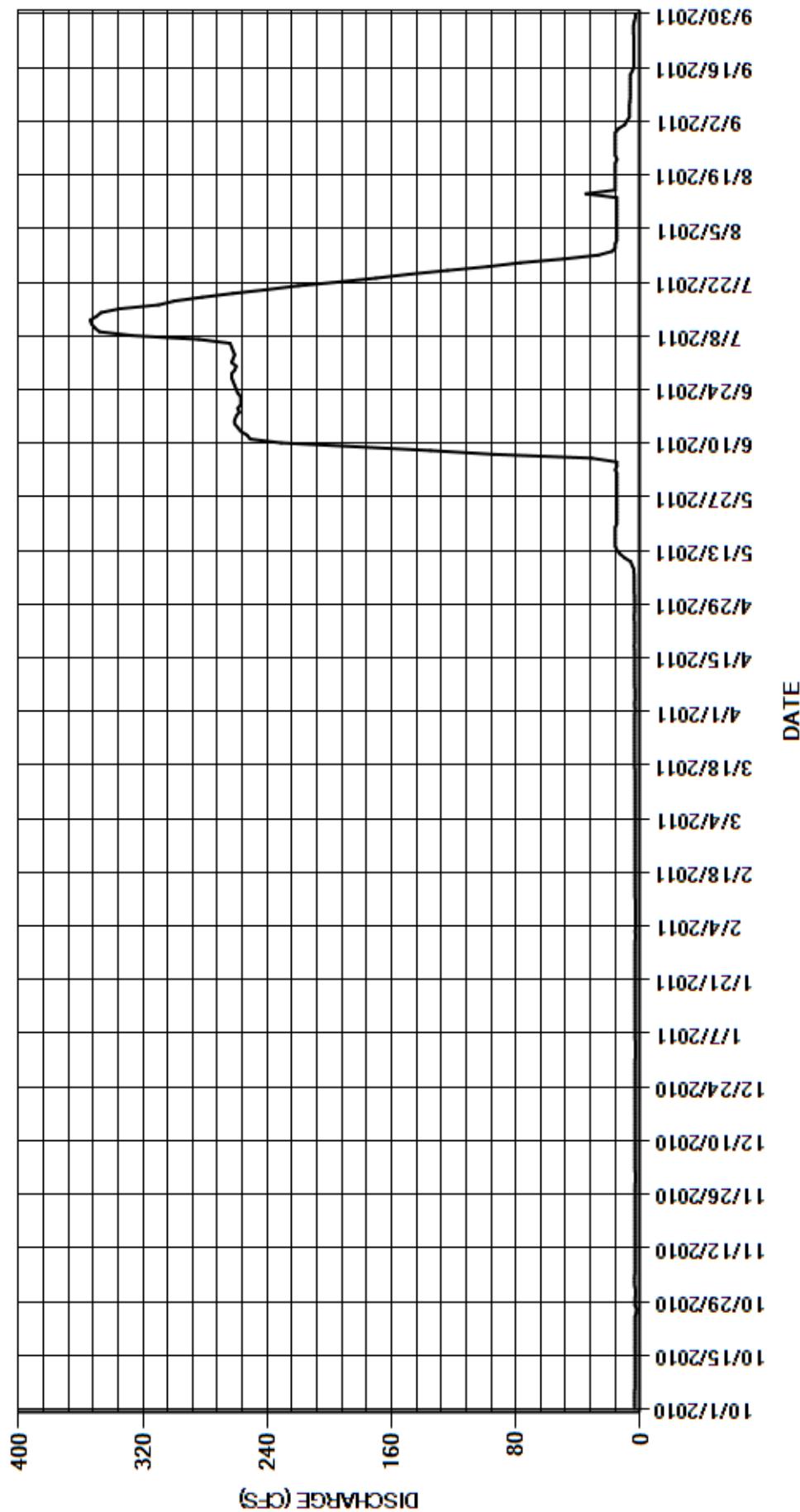
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.6	3.1	3.1	3.1	3.1	3.4	3.4	3.7	15	263	16	10
2	3.7	3.5	3.3	3.1	3.2	3.4	3.5	3.8	15	262	15	8.7
3	3.7	3.7	3.4	3.1	3.2	3.4	3.6	3.8	16	261	15	7.0
4	3.7	3.7	3.4	3.1	3.1	3.4	3.4	3.8	15	262	15	7.0
5	3.6	3.5	3.4	3.2	3.1	3.4	3.4	3.8	15	263	15	7.0
6	3.5	3.4	3.4	3.4	3.1	3.4	3.4	3.9	31	264	15	7.0
7	3.4	3.4	3.4	3.4	3.1	3.4	3.5	4.0	94	284	15	6.7
8	3.4	3.4	3.4	3.4	3.1	3.4	3.6	4.0	135	327	15	6.5
9	3.4	3.4	3.4	3.4	3.1	3.4	3.7	5.2	183	348	15	6.5
10	3.4	3.4	3.4	3.4	3.1	3.4	3.7	6.1	231	351	15	6.5
11	3.4	3.4	3.4	3.4	3.2	3.4	3.7	10	251	353	15	6.5
12	3.4	3.4	3.4	3.4	3.4	3.4	3.7	13	253	354	15	6.5
13	3.4	3.4	3.4	3.4	3.4	3.4	3.7	15	257	350	15	6.5
14	3.4	3.4	3.4	3.4	3.4	3.4	3.7	16	259	347	35	6.5
15	3.4	3.4	3.3	3.4	3.4	3.4	3.7	16	261	335	16	5.2
16	3.4	3.4	3.3	3.4	3.4	3.4	3.7	16	261	310	16	4.0
17	3.5	3.4	3.4	3.4	3.4	3.5	3.7	16	260	300	16	4.0
18	3.4	3.4	3.4	3.4	3.4	3.7	3.8	16	258	282	16	4.0
19	3.4	3.4	3.4	3.4	3.4	3.6	3.7	16	259	262	16	4.0
20	3.4	3.4	3.4	3.4	3.4	3.6	3.7	15	257	240	16	4.0
21	3.4	3.4	3.4	3.4	3.4	3.7	3.7	15	257	220	16	4.0
22	3.4	3.4	3.4	3.4	3.4	3.7	3.7	15	257	194	16	4.0
23	3.4	3.4	3.4	3.4	3.4	3.7	3.7	15	259	170	15	4.0
24	3.4	3.4	3.4	3.4	3.4	3.7	3.7	15	260	149	16	4.2
25	3.4	3.4	3.4	3.4	3.4	3.7	3.8	15	261	124	16	4.3
26	2.6	3.4	3.4	3.4	3.4	3.7	3.8	15	262	98	16	4.3
27	2.4	3.4	3.4	3.4	3.4	3.7	3.7	15	263	77	16	4.3
28	3.4	3.3	3.4	3.4	3.4	3.7	3.7	15	263	49	16	3.8
29	3.4	3.2	3.4	3.4	---	3.7	3.7	15	261	27	16	3.1
30	3.3	3.1	3.4	3.4	---	3.7	3.7	15	260	18	16	3.1
31	3.1	---	3.3	3.3	---	3.6	---	15	---	16	14	---
TOTAL	104.7	101.9	104.7	103.9	92.2	109.4	109.5	356.1	5929	7160	500	163.2
MEAN	3.38	3.40	3.38	3.35	3.29	3.53	3.65	11.5	198	231	16.1	5.44
AC-FT	208	202	208	206	183	217	217	706	11760	14200	992	324
MAX	3.7	3.7	3.4	3.4	3.4	3.7	3.8	16	263	354	35	10
MIN	2.4	3.1	3.1	3.1	3.1	3.4	3.4	3.7	15	16	14	3.1
CAL YR	2010	TOTAL	3612.0	MEAN	9.90	MAX	240	MIN	2.4	AC-FT	7160	
WTR YR	2011	TOTAL	14834.6	MEAN	40.6	MAX	354	MIN	2.4	AC-FT	29420	

MAX DISCH: 395 CFS AT 15:15 ON JUL 11,2011 GH 1.99 FT SHIFT 0.01 FT

MAX GH: 1.99 FT AT 15:15 ON JUL 11,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07082500 LAKE FORK CREEK BELOW SUGAR LOAF DAM NEAR LEADVILLE
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
07084500 LAKE CREEK ABOVE TWIN LAKES RESERVOIR
Water Year 2011

Location.--	Lat 39°03'47", Long 106°24'28" (Mt. Elbert, Colorado quadrangle, 1:24000 scale), in NE1/4 SE1/4 Sec. 26, T11S, R81W, Lake County, Hydrologic Unit 11020001, on left bank at refurbished concrete section and bridge over Lake Creek originally established by US Forest Service, 1.35 mile upstream from high water line of Twin Lakes Reservoir, 0.65 miles upstream from Willis Creek tributary, and 2.1 miles southwest of village of Twin Lakes CO.
Drainage Area and Period of Record.--	75 mi ² . April 1946 to Sept. 1962, Oct. 1963 to current year. Monthly data only for some periods.
Equipment.--	Constant flow bubbler sensor and satellite-monitored data collection platform in a 4 ft x 4 ft metal shelter. Primary reference gage is a drop wire weight mounted on the pedestrian bridge over the control. A temperature sensor is operated at the site. No changes this water year.
Hydrologic Conditions.--	Lake Creek fills Twin Lakes Reservoir and is tributary to the main stem of the Arkansas River. Flows at the gage are heavily affected by transmountain diversions from the Roaring Fork Basin in Division 5 through Twin Lakes Tunnel and into Lake Creek several miles above the gage. Diversions occur year round. Lake Creek Basin is approximately 73.1 sq miles with a mean elevation of 11,900 ft. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except many low volume trail roads and Highway 82 that travels over Independence Pass. No hydrologic condition changes were apparent this water year.
Gage-Height Record.--	The primary record is fifteen minute satellite transmitted data with DCP log and CFB log used as backup. Record is complete and reliable, except for the following periods: Oct 26-29; Nov 11, 2010, when ice affected the stage discharge relationship; and Nov 12, 2010 – Mar 15, 2011 when the station was closed for the winter. Turbulence at the gage, caused by the high flow velocities and large boulders, makes reading the wire weight gage for the site very difficult -- with accuracy of only ±0.10 ft during high water. This water year the wire weight gage was read to note the large discrepancies in gage height, but corrections to the CFB were not applied during times of high water. The CFB is calibrated before high water commences and is checked again once high water subsides and is re-calibrated as needed.
Datum Corrections.--	Levels were last run May 9, 2006.
Rating.--	The control at low flow (±50 cfs) is the 25-ft. long by 41.8 ft. wide concrete apron edged with angle iron on the upstream and downstream sides at lower flows. At higher flows the channel immediately above the concrete section is the control along with the vertical walls of the concrete section. The concrete section also serves as a measuring base for high flow measurements made from a bridge directly over the control. Wading measurements are made on the same concrete apron during winter as this section stays more open than surrounding sections, although considerable ice breaking is required. Outside of winter, wading measurements are made downstream at the old gage location as flow is more laminar and steady there. Whether wading or cabling, velocities are in the extreme range and this station is difficult to measure. This is especially true for cable measurements. For any flows above 500 cfs, a 100 lb. weight is required, and the depths are so shallow that placing the meter in the correct velocity profile is problematic. Rating No. 23, dated Nov 20, 2007, was used this year. Rating No. 23's average rating error continues to grow more negative as in WY2008 the average error was -9.1% and in WY2011 the error averaged -37.2%. Thirteen discharge measurements (Nos. 1011-1023) were made during the water year, ranging in discharge from 13.7 to 1590 cfs. Five of these measurements were during the winter period and have no gage heights or shift but are used for winter estimation. Measurements covered the range in stage experienced, except higher daily flows of June 16, 17, 24-26, 29-30; July 1-9 2011. The peak discharge of 2020 cfs occurred at 2100 hours on June 30, 2011 at a gage height of 6.59 ft. with a shift of -0.48 ft. It exceeded maximum flow Measurement No. 1022, made July 8, 2011, by 0.49 ft. in stage.
Discharge.--	Shifting control method was used for all periods of good record. Shifts were applied as defined by measurements and were distributed by time. Variable stage shift curve LAKATLCOV11A was developed for the hydrograph peak using Measurement No. 1019-1023 and was applied for the period May 4 - August 10, 2011. Open water measurements for this water year indicated shifts varying from -0.51 to -0.25 ft. Measurement No. 1020 was discounted by -0.68% for smoothing purposes on the variable shift curve. Shifts continued to be negative throughout the water year and this is attributed to filling in of the approach channel section above the concrete control by cobble and large boulders. The concrete is essentially no longer the control, and channel control at the section and above controls flows.
Special Computations.--	Discharge for periods of no gage-height or ice affected record were estimated based on record from the upstream station of Twin Lakes Tunnel added to an estimated based flow and adjusted daily from weather records. Estimated base flow is derived from five measurements (Nos. 1012-1016). A hydrograph was used comparing estimated and computed flows with the upstream gage Twin Lakes Tunnel. Temperature data from this site was used in the estimating winter flows.
Remarks.--	Record is good, except during periods of ice affect and no record, which are estimated and poor. Peak discharge is rated fair due to inability to accurately read the primary outside gage during the event. Station maintained and record developed by Cheston Hart.

Recommendations.--

The approach to the concrete section should be cleared allowing the concrete to become the control. Additional measurements during peak run off need to be made to help define shifts across the runoff period. Levels need to be run in WY12.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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07084500 LAKE CREEK ABOVE TWIN LAKES RESERVOIR

RATING TABLE-- LAKATLCO23 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

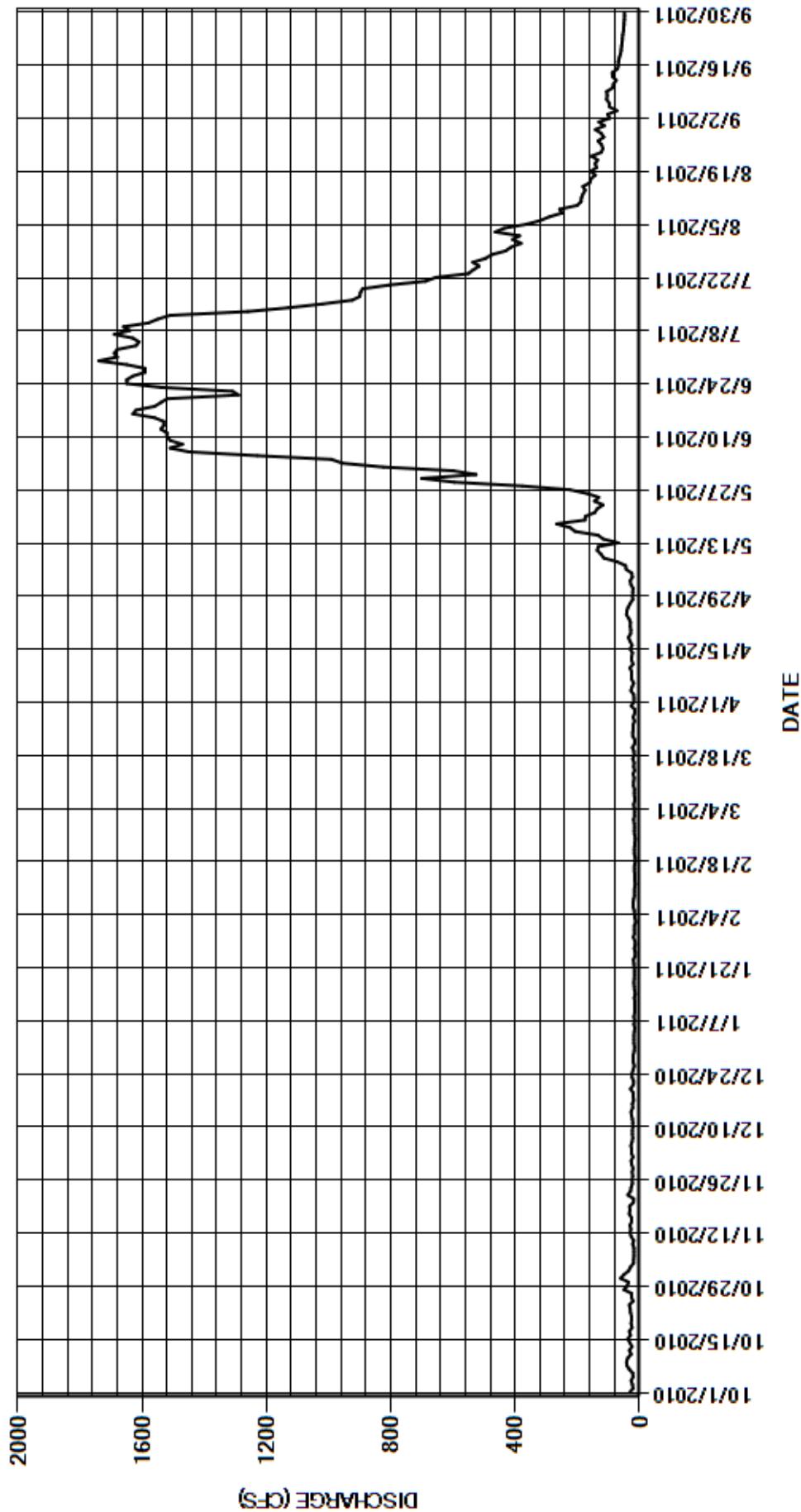
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	31	50	e27	e18	e17	e19	18	21	599	1680	408	131
2	21	35	e21	e18	e12	e16	18	28	824	1690	386	96
3	23	29	e26	e18	e15	e16	19	30	956	1680	464	103
4	27	19	e25	e17	e16	e17	28	23	991	1620	435	73
5	21	19	e28	e15	e17	e19	24	25	1230	1610	365	97
6	22	18	e24	e18	e21	e15	19	43	1450	1630	320	98
7	33	18	e22	e16	e21	e16	25	45	1510	1690	290	106
8	41	18	e23	e18	e19	e17	26	72	1470	1640	249	104
9	42	22	e23	e16	e16	e16	25	115	1510	1660	257	106
10	38	19	e22	e15	e16	e20	31	124	1520	1580	201	87
11	27	e27	e22	e16	e16	e19	21	136	1520	1550	188	84
12	33	e30	e23	e15	e14	e17	25	133	1540	1510	187	75
13	24	e28	e26	e17	e16	e21	25	68	1530	1260	182	87
14	31	e31	e27	e14	e15	e16	23	117	1530	1130	175	88
15	38	e25	e22	e16	e16	e19	30	133	1560	1020	182	71
16	29	e26	e23	e17	e16	17	24	207	1630	925	160	68
17	33	e33	e19	e18	e16	22	30	223	1620	900	157	68
18	24	e31	e21	e17	e14	17	36	267	1560	898	142	65
19	27	e32	e21	e16	e14	18	29	176	1540	891	157	61
20	26	e20	e29	e16	e17	23	28	174	1520	806	138	59
21	26	e19	e20	e17	e17	16	30	144	1290	688	143	58
22	29	e38	e19	e18	e16	15	29	136	1310	656	135	56
23	30	e29	e24	e20	e15	22	34	117	1540	551	154	55
24	33	e27	e24	e14	e14	22	42	145	1650	535	123	54
25	21	e23	e21	e14	e16	20	41	131	1650	516	118	52
26	e26	e24	e17	e17	e17	21	37	168	1630	536	122	51
27	e25	e22	e20	e14	e16	16	30	224	1590	496	134	50
28	e50	e24	e20	e15	e17	21	22	377	1590	476	115	49
29	e40	e21	e20	e20	---	16	23	596	1650	431	123	48
30	35	e25	e17	e16	---	15	22	701	1740	413	142	48
31	61	---	e16	e17	---	27	---	526	---	381	113	---
TOTAL	967	782	692	513	452	571	814	5425	43250	33049	6465	2248
MEAN	31.2	26.1	22.3	16.5	16.1	18.4	27.1	175	1442	1066	209	74.9
AC-FT	1920	1550	1370	1020	897	1130	1610	10760	85790	65550	12820	4460
MAX	61	50	29	20	21	27	42	701	1740	1690	464	131
MIN	21	18	16	14	12	15	18	21	599	381	113	48
CAL YR	2010	TOTAL	70767	MEAN	194	MAX	2730	MIN	12	AC-FT	140400	
WTR YR	2011	TOTAL	95228	MEAN	261	MAX	1740	MIN	12	AC-FT	188900	

MAX DISCH: 2020 CFS AT 21:00 ON JUN 30,2011 GH 6.59 FT SHIFT -0.48 FT

MAX GH: 6.59 FT AT 21:00 ON JUN 30,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07084500 LAKE CREEK ABOVE TWIN LAKES RESERVOIR
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
LAKE CREEK BELOW TWIN LAKES RESERVOIR
Water Year 2011

Location.--	Lat. 39°04'34", Long. 106°18'35", in NE $\frac{1}{4}$ SE $\frac{1}{4}$, sec. 22, T.11 S., R. 80 W., Lake County, on right bank 1.2 miles upstream from confluence of Lake Creek and Arkansas River and 1500 ft downstream of Twin Lakes Dam.
Drainage Area and Period of Record.--	N/A.
Equipment.--	Satellite-monitored high data collection platform, shaft encoder, stage-discharge recorder (SDR) and well in a concrete shelter. Shaft encoder and SDR are set to an inside electric tape-down mounted on instrument shelf. Outside staff gage installed in flume but generally used as backup to primary reference tape-down gage. Control is a 30-foot concrete Parshall flume.
Hydrologic Conditions.--	The gage is located approximately 400 ft downstream of the outlet of Twin Lakes Reservoir. The water released is warm enough so the control does not experience ice affected days. No hydrologic condition changes were apparent this year.
Gage-Height Record.--	Primary record is 15-minute satellite data with the SDR data log used for backup purposes. Record is complete and reliable for the entire year.
Datum Corrections.--	Levels were last run on Sept. 6, 2007. Results were well within allowable limits; no corrections were needed/ taken. For the five years prior to that levels results indicated the gage is very stable.
Rating.--	Control at all stages is a 30-ft. concrete Parshall flume. A standard 30 ft. Parshall flume table was used all year. It is well defined at all stages. Nine discharge measurements (Nos. 127-135) were made this year ranging from 116 cfs to 1610 cfs. Measurements cover the range in stage experienced except for the lower mean daily flows on Oct 1, 2010 – Jan 5, 2011; Mar 24-Apr 25; Sep 7-30 2011. The peak discharge of 1630 cfs occurred at 2300 July 10, 2011 at a gage height of 4.85 ft with a shift of 0.44 ft. The maximum gage height exceeded maximum measurement No. 134 by 0.03 ft. in stage.
Discharge.--	Shifting control method was used for the entire water year. Shifts were distributed using variable stage shift relationship, LAKBTLCOVS11D, which is based on historical low flow measurements and high flow measurements made at the gage in WY10 and WY11 using an ADCP. Measurements 127, 128, 130-133 were discounted between 3.45% to -1.10% to fit this variable relationship.
Special Computations.--	None.
Remarks.--	The record is good. Peak GH and discharge are rated good based on site visits and surrounding measurements. Wading measurements are made in the flume at the staff gage/ intake cross section. Eyebolts in the flume walls at this section are used to attach a safety cable with 2 ft. markings. The maximum flow that can be safely waded in the flume is about 250 cfs (gage height = 1.61 ft). Flows up to about 400 cfs (gage height = 2.20 ft) can be waded about 150 ft downstream of the flume. There is no bridge at this flume. Approximately 1,000 ft downstream is the Highway 82 Bridge across Lake Creek. Conventional cable measurement from this bridge would be very difficult due to traffic and varying angle of flow caused by the bridge itself. ADCP measurements are made from this section with positive results. Station maintained and record developed by Cheston Hart.
Recommendations.--	Installation of a bank operated cable system below the control will allow safe and timely measurements at all stages for this site.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

LAKE CREEK BELOW TWIN LAKES RESERVOIR

RATING TABLE-- STD30FTPF USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

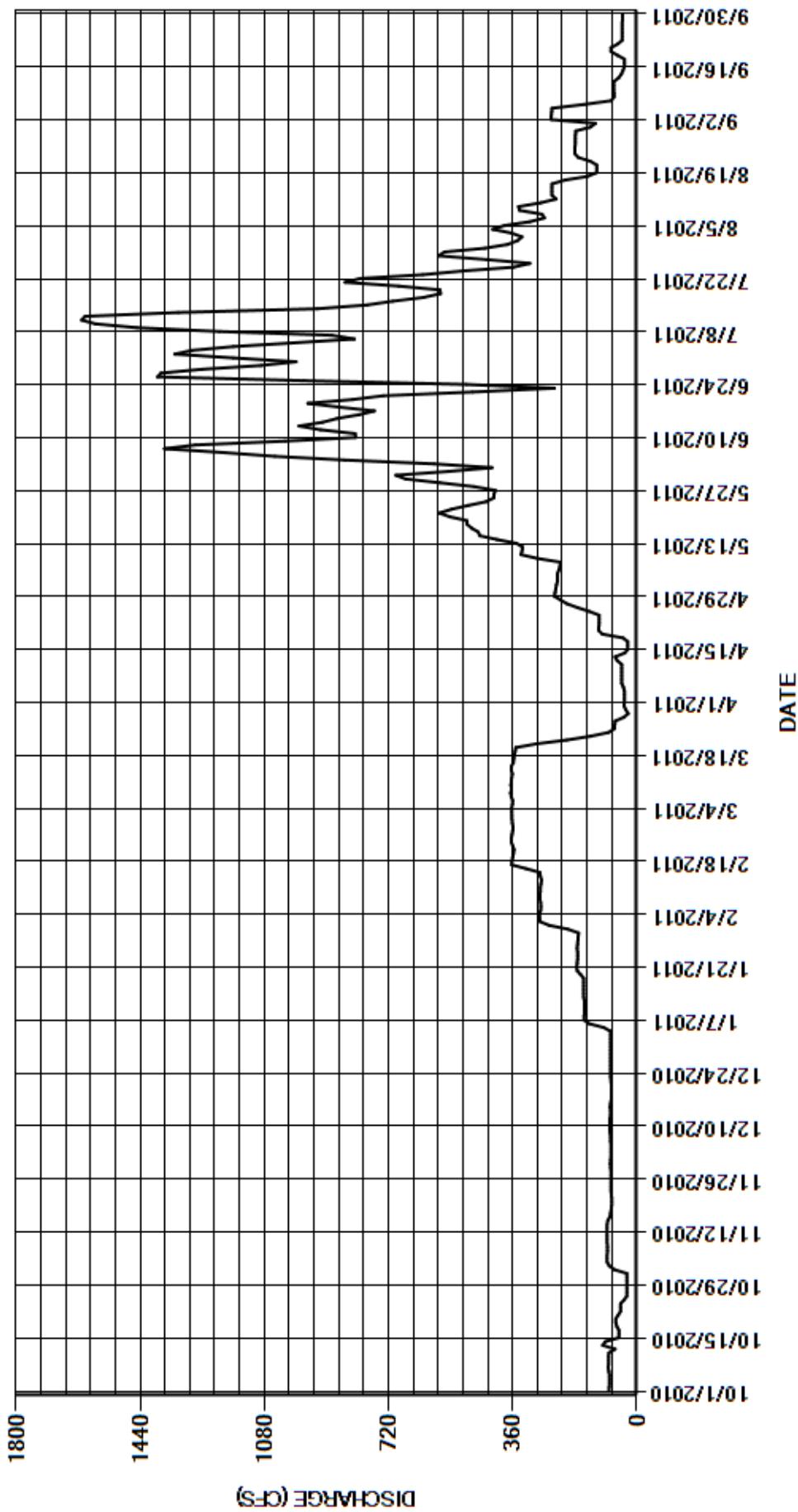
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	80	29	76	76	254	362	36	235	545	1170	346	120
2	80	65	75	76	281	362	36	233	420	1340	333	248
3	79	80	75	76	282	363	36	230	588	1290	363	248
4	79	86	75	76	282	363	36	230	847	1170	418	247
5	79	86	75	96	279	361	39	230	1050	995	384	246
6	81	86	76	138	278	360	44	226	1200	819	311	153
7	83	85	76	153	279	364	44	223	1370	885	268	74
8	82	85	77	153	281	366	44	221	1280	1210	275	66
9	82	86	79	152	281	363	44	288	1020	1450	340	66
10	82	86	78	152	280	365	44	336	815	1570	343	67
11	81	86	78	152	280	364	44	333	817	1610	279	67
12	63	86	78	152	278	363	57	331	917	1600	234	67
13	99	86	76	154	276	361	63	349	980	1330	246	53
14	91	86	76	154	280	364	35	406	911	927	246	45
15	52	84	78	154	281	364	26	455	869	782	246	40
16	52	78	76	154	321	358	26	460	805	708	246	36
17	52	76	74	154	363	357	26	479	761	618	209	36
18	58	74	74	154	362	355	40	492	863	569	143	36
19	61	73	74	163	360	353	100	493	954	571	116	56
20	61	73	74	173	358	351	111	542	824	691	116	75
21	54	73	74	174	356	291	110	573	736	846	116	75
22	47	74	75	173	360	203	109	537	476	802	135	55
23	47	75	76	172	364	134	109	489	239	621	170	42
24	47	75	76	172	364	82	109	437	494	502	180	42
25	37	75	76	172	362	65	138	415	967	357	179	42
26	29	75	76	173	360	64	172	414	1390	310	179	42
27	29	75	76	172	359	63	202	410	1380	436	178	42
28	29	75	76	171	361	38	221	473	1260	575	178	42
29	29	76	76	170	---	25	239	571	1090	558	178	41
30	29	77	76	169	---	32	237	670	988	441	177	41
31	29	---	76	200	---	37	---	699	---	375	135	---
TOTAL	1883	2326	2353	4630	8822	8253	2577	12480	26856	27128	7267	2510
MEAN	60.7	77.5	75.9	149	315	266	85.9	403	895	875	234	83.7
AC-FT	3730	4610	4670	9180	17500	16370	5110	24750	53270	53810	14410	4980
MAX	99	86	79	200	364	366	239	699	1390	1610	418	248
MIN	29	29	74	76	254	25	26	221	239	310	116	36
CAL YR	2010	TOTAL	66683	MEAN	183	MAX	1420	MIN	11	AC-FT	132300	
WTR YR	2011	TOTAL	107085	MEAN	293	MAX	1610	MIN	25	AC-FT	212400	

MAX DISCH: 1630 CFS AT 23:00 ON JUL 10,2011 GH 4.85 FT SHIFT 0.44 FT

MAX GH: 4.85 FT AT 23:00 ON JUL 10,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LAKE CREEK BELOW TWIN LAKES RESERVOIR
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
07086000 ARKANSAS RIVER AT GRANITE
Water Year 2011

Location.--	Lat. 39°02'34", Long. 106°15'55", in SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 31, T.11 S., R.79 W., Chaffee County, Hydrologic Unit 11020001, on right bank at Granite, 100 ft east of U.S. Highway 24, 100 ft downstream from county bridge, and 200 ft upstream from Cache Creek.
Drainage Area and Period of Record.--	427 mi ² . Sporadic data from April 1895 to May 1901. Complete data from April 1910 to current year. Monthly data for some periods only.
Equipment.--	Graphic water-stage recorder, satellite-monitored data collection platform and shaft encoder in 42-inch diameter corrugated metal pipe (CMP) shelter and well. Shaft encoder and chart set to inside electric tape gage. Gage shelter is supplied with AC power. A stock tank heater is used inside the well during periods of freezing weather to keep well open. A cableway for high flow measurements is located approximately 100 feet downstream from gage.
Hydrologic Conditions.--	The Arkansas River at Granite is located below both Twin Lakes and Turquoise Lake. The flow conditions are subject to releases from these lakes as well as native flows. Natural drainage area is approximately 427 sq miles. The basin consists of high mountain terrain some of which is above tree line with very little development.
Gage-Height Record.--	Primary record is 15-minute satellite data with DCP log and chart record used for back-up purposes. The record is complete and reliable, except for the following periods: Nov 18-28, 2010, Dec 10-31, 2010 and Jan 1-5, 2011, when the well was frozen due to issues with stock tank heater; Feb 2, 3, 7, 10, 2011 when the stage discharge relationship was effected by ice. The shelter and well are situated on the right bank in calm water subject to significant shore ice, including complete channel and control freeze-over during periods of freezing weather.
Datum Corrections.--	No levels were run this water year. Levels were last run Aug. 8, 2005.
Rating.--	Control is a boulder riffle 150 ft downstream. At high water stages channel and banks are the control. Rating No. 11A, implemented in Dec 2002, was used for the water year. It is well defined by measurements from 64 cfs to 3000 cfs and remains relevant with an average rating error of 0.96%. Eleven discharge measurements (Nos. 394-404) were made during the water year ranging in discharge from 169 to 2550 cfs. They cover the range in flows experienced except for the lower daily flow of Oct 1-6, 12, 15-31; Nov 1,2, 12-13, 18-28; Dec 1-31, 2010; Jan 1-4; Mar 23-31; Apr 1-18; Sept 22-30, 2011, and higher flows of Jun 26, 27; July 2, 3, 9-12, 2011. The peak flow of 2950 cfs occurred at 1445 on July 10, 2011 at a gage height of 5.69 ft with a shift of +0.22 ft. It exceeded mean stage of Measurement No. 402, made July 13, 2011 by 0.36 ft. in stage.
Discharge.--	Shifting control method was used during all periods of ice-free record. Shifts were distributed using shift curve ARKGRNCOVS11A for the entire water year. Measurements show shifts varying from -0.06 ft. to +0.22 ft. All were given full weight and applied directly, except for Meas. Nos. 397, 399, 401-404 which were discounted from -3.21% to +6.25% to smooth shifts and shift curve transitions.
Special Computations.--	Discharge for periods of no or suspect gage-height record and ice-affected record were estimated on the basis of related measurements, surrounding good record, weather records, site visits and by using the final record from Lake Creek below Twin lakes. A hydrograph was used comparing flows with up and downstream gages. Multiple ADCP measurements were attempted both on the cableway and with temporary cable systems.
Remarks.--	Record good, except during periods of no or suspect gage height record and ice effect, which are poor. Peak is rated good given the field measurement taken three days after the peak. Station maintained and record developed by Cheston Hart.
Recommendations.--	Continued use of the ADCP from the cableway should help confirm its effectiveness during the high water periods. Levels should be run in the upcomming water year.

STATE OF COLORADO
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07086000 ARKANSAS RIVER AT GRANITE

RATING TABLE-- ARKGRNCO11A USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

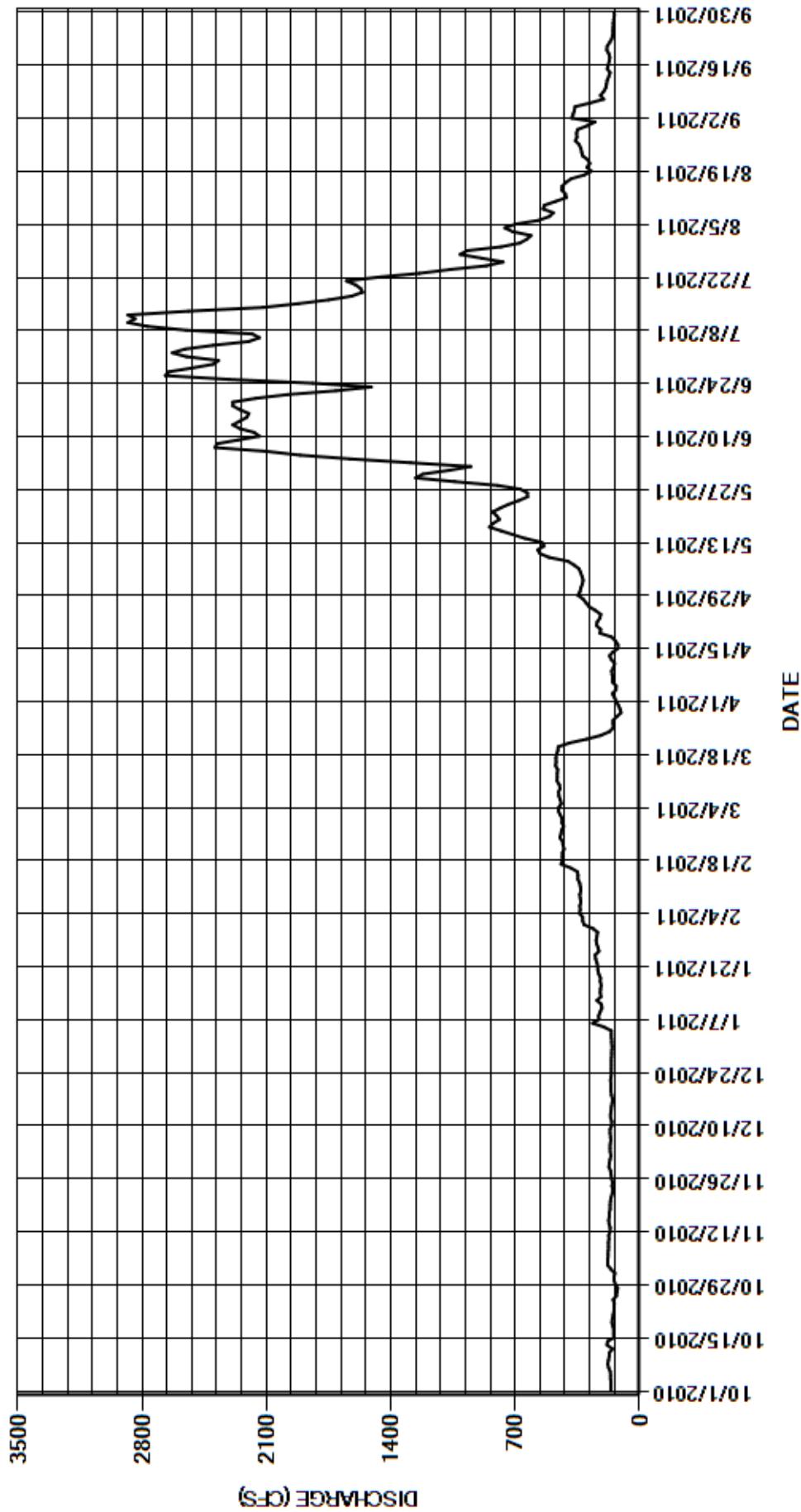
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	162	139	166	e157	312	436	131	330	1070	2550	635	251
2	160	160	161	e158	e320	446	141	322	950	2630	611	382
3	161	178	165	e159	e320	457	153	318	1290	2560	713	374
4	163	179	166	e159	338	454	133	324	1630	2400	758	367
5	163	178	165	e200	334	441	131	332	1910	2200	699	363
6	165	177	162	264	336	446	151	341	2100	2140	568	278
7	174	176	163	229	e330	454	151	369	2390	2180	508	202
8	179	175	166	230	334	456	154	404	2380	2550	485	220
9	175	176	166	222	336	448	157	509	2260	2770	543	202
10	171	172	e157	212	e330	452	146	560	2140	2880	535	190
11	170	174	e156	215	333	465	140	573	2170	2840	473	186
12	152	165	e163	240	337	463	158	538	2250	2880	412	182
13	183	165	e163	217	347	463	169	551	2290	2540	418	173
14	180	172	e160	221	346	461	150	644	2250	2120	438	166
15	144	174	e158	220	350	473	121	712	2210	1920	436	182
16	146	170	e154	216	387	469	122	779	2200	1750	415	176
17	145	170	e152	221	442	471	137	845	2250	1620	384	171
18	150	e165	e158	220	434	467	158	824	2290	1560	310	168
19	156	e165	e161	230	435	460	223	789	2290	1570	272	173
20	153	e164	e161	235	434	458	219	804	2160	1600	297	185
21	148	e160	e162	236	425	395	243	828	1980	1650	280	182
22	144	e154	e163	240	431	298	238	785	1710	1470	291	168
23	144	e150	e160	247	433	218	223	738	1510	1240	320	156
24	142	e155	e159	250	449	169	219	680	1840	1070	326	151
25	149	e152	e159	229	442	148	249	630	2310	863	330	150
26	130	e158	e158	234	439	149	284	631	2670	768	340	149
27	128	e160	e158	242	427	149	301	670	2650	888	361	148
28	123	e163	e158	244	438	127	318	799	2520	1010	352	145
29	136	172	e157	240	---	104	347	1040	2400	970	355	142
30	143	171	e156	236	---	110	335	1260	2370	780	348	143
31	144	---	e155	262	---	120	---	1220	---	674	293	---
TOTAL	4783	4989	4968	6885	10619	11127	5802	20149	62440	56643	13506	6125
MEAN	154	166	160	222	379	359	193	650	2081	1827	436	204
AC-FT	9490	9900	9850	13660	21060	22070	11510	39970	123800	112400	26790	12150
MAX	183	179	166	264	449	473	347	1260	2670	2880	758	382
MIN	123	139	152	157	312	104	121	318	950	674	272	142
CAL YR	2010	TOTAL	131092	MEAN	359	MAX	2890	MIN	76	AC-FT	260000	
WTR YR	2011	TOTAL	208036	MEAN	570	MAX	2880	MIN	104	AC-FT	412600	

MAX DISCH: 2950 CFS AT 14:45 ON JUL 10,2011 GH 5.69 FT SHIFT 0.22 FT

MAX GH: 5.69 FT AT 14:45 ON JUL 10,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07086000 ARKANSAS RIVER AT GRANITE
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
07086500 CLEAR CREEK ABOVE CLEAR CREEK RESERVOIR
Water Year 2011

Location.--	Lat. 39°01'05", Long. 106°16'38", in SE $\frac{1}{4}$ sec. 12, T,12 S., R.80 W., Chaffee County, Hydrologic Unit 11020001, on right bank 0.5 mi upstream from water line of Clear Creek Reservoir at elevation 8,875 ft, 1.5 mi downstream from unnamed tributary, and 1.9 mi southwest of Granite.
Drainage Area and Period of Record.--	67.1 mi ² .
Equipment.--	Graphic water-stage recorder, satellite-monitored data collection platform and shaft encoder in a 42-inch diameter corrugated metal pipe (CMP) shelter and well. Shaft encoder and chart set to inside drop tape gage with adjustable RP on instrument shelf. Control is a concrete dam tapered lower towards the center, located approximately 10 feet downstream. An outside staff gage is used as a supplemental reference gage. However, since its installation, it does not agree with the inside tape, most likely due to draw-down. No changes this water year.
Hydrologic Conditions.--	Clear Creek fills Clear Creek Reservoir and is tributary to the main stem of the Arkansas River. Clear Creek basin is approximately 42,880 acres with a mean elevation of 11,700 ft. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except a low volume trail road. No hydrologic condition changes were apparent this water year.
Gage-Height Record.--	Primary record is 15-minute satellite data with the chart record used for back-up purposes. The record is complete and reliable, except for the following periods: Nov 10-11, 2010 and March 23-26, 2011 when the stage-discharge relationship was affected by ice; Nov. 12, 2010 through March 22, 2011 when the station was closed for the winter.
Datum Corrections.--	Levels were last run on Aug 19, 2009. No corrections were needed/ taken.
Rating.--	The control is a concrete dam tapered lower towards the center and located 10 ft below the gage. Control at high stages includes brush and boulders lining the edges of the channel. Rating No. 14, dated 20 Feb 1996, was used for the entire water year. Fourteen discharge measurements (Nos. 110-123) were made during the water year, ranging in discharge from 13.2 to 487 cfs. They cover the range in stage experienced, except for the higher daily flows of June 15-17, 23-30; July 1-4, 7-9, 2011 and lower daily flows of Jan 1, 2, 10-12, 23-25; Feb 1-12, 19-28; Mar 4, 2011. The peak flow of 930 cfs occurred at 0115 June 25, 2011 at a gage height of 4.72 ft with a shift of +0.28 ft. It exceeded Measurement No. 120, made June 28, 2011, by 0.47 ft. in stage.
Discharge.--	Shifting control method was used for all periods of good, ice-free record. Shifts were applied as defined by measurements and were distributed by time and stage. The condition of this weir and the approach channel are assumed to be the cause of the more positive shifts. Variable shift curve CCACRCOVS11 was utilized during the peak period from May 4, 2011 at 14:15 through Sep 1, 2011 at 13:00 to compute discharge. Open water measurements indicated shifts varying from +0.10 to +0.28 ft. All open water measurements were given full weight and applied directly except for Measurement No. 117-119 and 121-123 which were adjusted between -5.92% and 7.35% for smoothing purposes.
Special Computations.--	Discharge for periods of no gage-height record and ice-affected record were estimated on the basis of six measurements (Nos. 110-115) and temperature records from Clear Creek Reservoir. Use of the ADCP was attempted and found to have issues with both the limited depth during normal flows and high velocities during peak flows. ADCP usage will be limited at this site. One successful measurement was made from the hiking bridge during high water. High water measurements were limited this year as the peak occurred in the middle of the night. Normally high water at this site has been found to be too shallow for a bridge cable measurement and unsafe for wading due to high velocities.
Remarks.--	Record good, except during periods of no gage height record and ice effect, which are estimated and poor. The peak gage height and peak discharge are rated fair considering related measurements and substantial shifts found at these gage heights. Inspection after the peak revealed that a large chunk of the control, near the middle, had broken off. This has contributed to the higher positive shifts since its occurrence. Station maintained and record developed by Cheston Hart.
Recommendations.--	More documentation of the weir condition is needed to track damage and wear that the weir is exhibiting. As damage to the weir continues, a new structure should be considered. Further investigation as to the difference between the outside gage and inside gage is needed.

STATE OF COLORADO
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07086500 CLEAR CREEK ABOVE CLEAR CREEK RESERVOIR

RATING TABLE-- CCACCRCO14 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

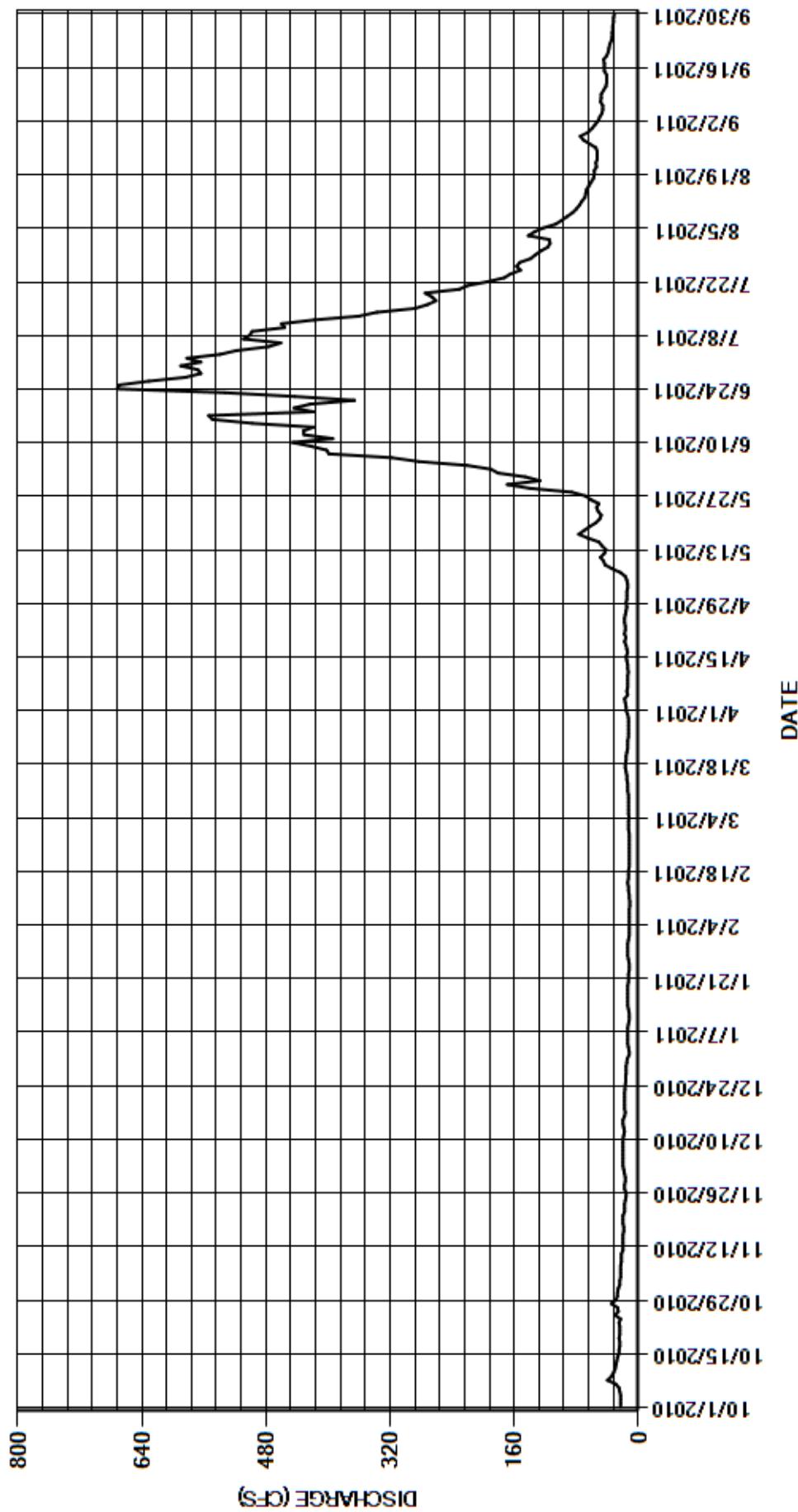
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	23	26	e18	e12	e12	e13	16	15	146	564	114	56
2	23	24	e19	e12	e12	e13	16	15	181	582	115	52
3	23	24	e20	e13	e12	e13	17	14	190	539	142	50
4	23	23	e20	e14	e12	e12	18	14	221	518	134	47
5	24	23	e20	e14	e12	e13	14	15	283	477	123	46
6	25	23	e20	e14	e12	e13	15	17	318	461	107	46
7	29	23	e20	e14	e12	e13	14	23	399	509	99	49
8	40	22	e20	e14	e12	e13	14	34	402	501	92	48
9	35	22	e20	e13	e11	e13	14	43	422	498	85	48
10	32	e22	e20	e12	e11	e13	14	45	446	456	80	45
11	30	e20	e19	e12	e12	e14	13	49	394	460	76	42
12	29	e20	e18	e12	e12	e14	14	44	431	418	73	41
13	28	e20	e19	e13	e13	e14	14	42	432	360	69	41
14	27	e20	e20	e14	e13	e15	15	47	419	337	68	41
15	25	e20	e20	e14	e14	e15	16	51	498	288	67	44
16	25	e19	e18	e14	e13	e16	14	65	549	272	64	44
17	24	e19	e17	e14	e13	e17	15	77	554	261	61	44
18	24	e20	e18	e14	e13	e17	16	70	419	266	58	45
19	25	e20	e18	e14	e12	e16	18	63	444	275	57	41
20	24	e20	e18	e13	e12	e16	16	55	423	231	57	39
21	24	e18	e18	e13	e12	e15	18	50	366	220	54	38
22	24	e18	e18	e13	e12	e14	17	48	443	194	55	37
23	25	e18	e18	e12	e12	e14	17	52	533	173	53	35
24	23	e17	e17	e12	e12	e14	18	54	672	165	53	34
25	30	e16	e16	e12	e12	e13	18	51	669	152	53	34
26	26	e16	e16	e13	e12	e13	17	61	631	157	55	33
27	27	e18	e16	e14	e12	13	16	68	584	153	63	33
28	35	e18	e16	e14	e12	13	15	86	564	139	71	32
29	29	e17	e16	e14	---	e13	16	140	568	133	75	32
30	27	e17	e15	e14	---	13	15	169	590	126	65	31
31	27	---	e14	e13	---	14	---	127	---	117	60	---
TOTAL	835	603	562	410	341	432	470	1704	13191	10002	2398	1248
MEAN	26.9	20.1	18.1	13.2	12.2	13.9	15.7	55.0	440	323	77.4	41.6
AC-FT	1660	1200	1110	813	676	857	932	3380	26160	19840	4760	2480
MAX	40	26	20	14	14	17	18	169	672	582	142	56
MIN	23	16	14	12	11	12	13	14	146	117	53	31
CAL YR	2010	TOTAL	20979	MEAN	57.5	MAX	788	MIN	9.0	AC-FT	41610	
WTR YR	2011	TOTAL	32196	MEAN	88.2	MAX	672	MIN	11	AC-FT	63860	

MAX DISCH: 930 CFS AT 01:15 ON JUN 25,2011 GH 4.72 FT SHIFT 0.28 FT

MAX GH: 4.72 FT AT 01:15 ON JUN 25,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07086500 CLEAR CREEK ABOVE CLEAR CREEK RESERVOIR
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
CLEAR CREEK BELOW CLEAR CREEK RESERVOIR
Water Year 2011

Location.--	Lat. 39°01'20", Long. 106°14'07", Lake County, on left bank 200 ft. upstream from junction Clear Creek and Arkansas River.
Drainage Area and Period of Record.--	68.98 sq. mi.
Equipment.--	High-Data-Rate data collection platform and shaft encoder in a wood frame shelter and concrete stilling well. A Stage Discharge Recorder (SDR) is used for backup purposes. The shaft encoder and SDR are set to the inside drop tape gage with adjustable RP on instrument shelf. Outside gage is used as supplemental reference. A bridge is located across the concrete section at the entrance to the converging section of the flume and used for making high water measurements. The compound weir was repaired February 28 through March 2, 2011.
Hydrologic Conditions.--	The gage is located approximately 1500 ft downstream of the outlet of Clear Creek Reservoir. The stream flows under the highway approximately 200 ft above the gage through three separate 6 ft diameter culverts. During the winter the water flows solely in the south culvert where winter flows are measured. The water released is warm enough the control does not experience ice affected days. No hydrologic condition changes were apparent this year.
Gage-Height Record.--	Primary record is fifteen-minute satellite data with the SDR log used for backup purposes. Record is complete and reliable. During the time the control was being replaced, gage height estimates were based on Measurement No. 241 which occurred just prior to construction start up and the fact the reservoir releases were held constant during this time.
Datum Corrections.--	Levels were last run on July 14, 2006. No corrections were required and level results in previous years have shown this gage to be stable.
Rating.--	The control is a 20-ft wide, compound, broad crested weir constructed in 1993 and repaired February 28 through March 2, 2011. Rating No. 4 was used all year. It is well defined to about 400 cfs. Eleven discharge measurements (Nos. 240-249) were made during the year. Measurements range in discharge from 1.06 to 399 cfs. They cover the range in stage except lower flows of Dec 7-31, 2010; Jan 1-5, 11-20, 28-31; Feb 1-10; Mar 3-14, 2011; and higher flow days of June 17-20, 25-29 2011. The peak flow of 410 cfs occurred at 0930 June 27, 2011 at a gage height of 3.18 ft with a shift of 0.12 ft. It exceeded the stage of Measurement No. 247 made June 30, 2011, by 0.02 ft.
Discharge.--	Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by time with consideration of stage from Oct 1 thru Mar 2, 2011. Variable shift curve CCBCCRCOVS11A was used starting Mar 2 (installation of new control) through the end of the water year. All measurements were given full weight except for Nos. 242-247, and 249 which were discounted between -4.9% and 4.8% to smooth shift distribution.
Special Computations.--	No special computations were used this year.
Remarks.--	Record is good, except for the winter low flow period: Nov 15, 2010 to Mar 15, 2011, which is fair to poor due to difficulty measuring the low flows and defining shifts; and Feb 28-Mar 2 2011 when there was no GH due to replacement of the weir which is estimated and rated poor. Peak GH and discharge are rated good based on site visit and measurement during the peak. Larger positive shifts during winter are due to leaks within the old weir. The previous control weir was constructed from two railroad ties with a shaped metal plate on top. The new control is an I beam with the original shaped metal plate welded to it. Overall the PZF is estimated to be within 0.10 ft of the previous control. Given the controlling structure was reused the existing rating was able to be continued this water year. Due to the depths at the measurement section the ADCP has become the primary measurement device. Station maintained and record developed by Cheston Hart.
Recommendations.--	The new control should be surveyed for confirmation of PZF. Further evaluation of the rating should continue and be updated if needed.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

CLEAR CREEK BELOW CLEAR CREEK RESERVOIR

RATING TABLE-- CCBCCRCO04 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

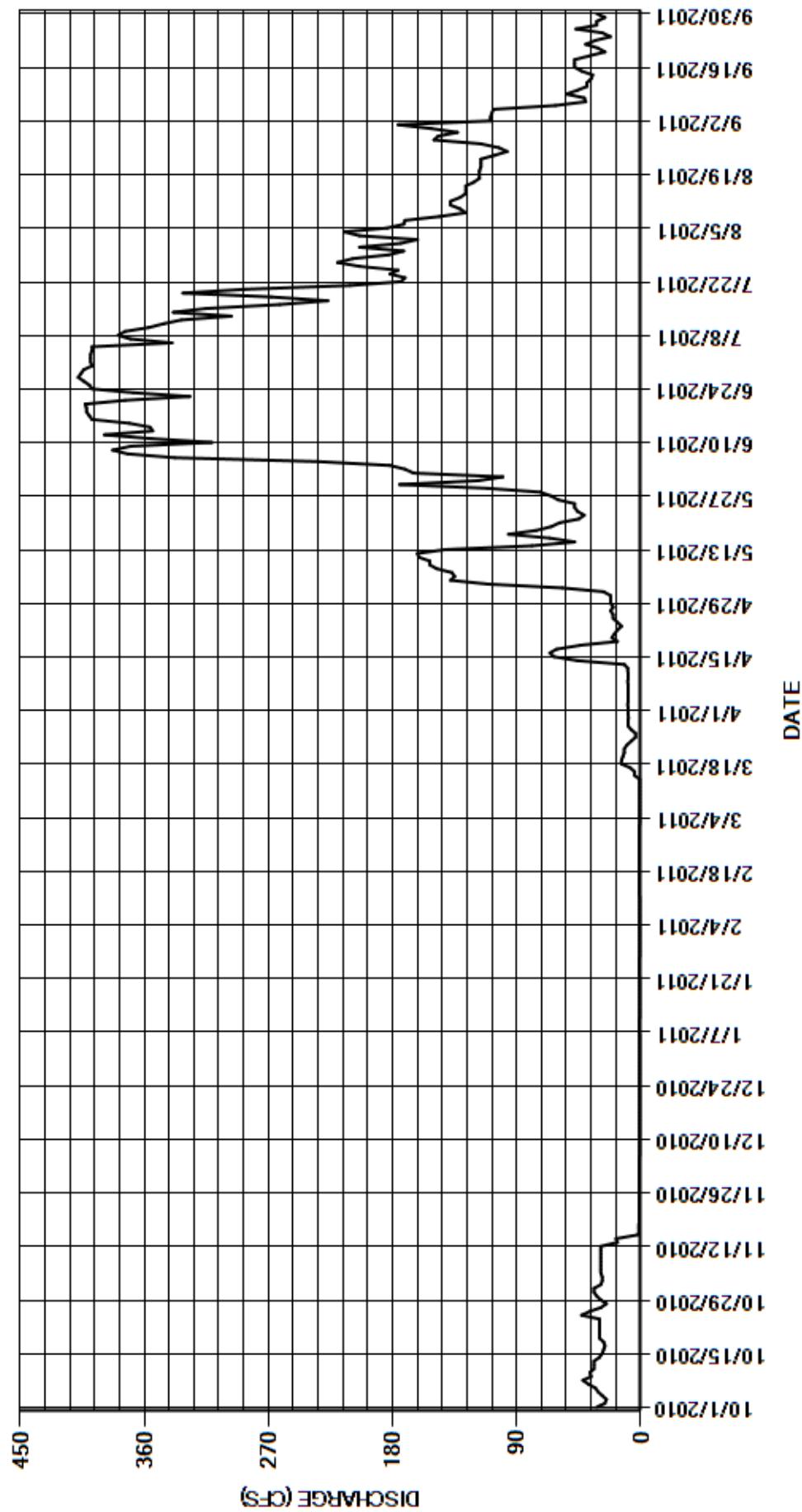
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	32	34	1.1	0.99	0.99	e1.1	9.3	22	100	399	174	176
2	26	29	1.1	0.99	0.99	e1.1	9.4	27	165	399	162	109
3	25	28	1.1	0.99	0.99	0.72	9.4	57	171	399	204	109
4	28	28	1.1	0.99	0.99	0.72	9.3	111	182	398	215	108
5	31	29	1.1	0.99	0.99	0.72	9.3	138	234	398	184	107
6	33	29	1.0	1.0	0.99	0.72	9.4	135	338	340	172	62
7	38	29	0.99	1.1	0.99	0.72	9.3	137	372	370	171	40
8	42	29	0.99	1.1	0.99	0.72	9.4	148	383	379	146	41
9	36	29	0.99	1.1	0.99	0.72	9.4	153	370	374	127	54
10	37	29	0.99	1.1	0.99	0.72	9.3	153	311	357	131	46
11	34	29	0.99	0.99	1.0	0.73	9.4	161	355	346	138	39
12	34	29	0.99	0.99	1.1	0.73	9.4	162	389	333	138	39
13	34	17	0.99	0.99	1.1	0.72	12	142	354	297	131	36
14	30	18	0.99	0.99	1.1	0.72	46	79	356	339	127	35
15	28	2.0	0.99	0.99	1.1	4.5	63	48	371	315	127	43
16	27	1.3	0.99	0.99	1.1	4.5	66	66	398	262	127	48
17	26	1.4	0.99	0.99	1.1	7.7	61	96	400	227	121	48
18	27	1.3	0.99	0.99	1.1	14	44	76	402	268	117	48
19	30	1.2	0.99	0.99	1.1	14	17	65	402	332	117	37
20	30	1.2	0.99	0.99	1.1	13	21	59	403	287	117	26
21	30	1.2	0.99	1.0	1.1	12	19	45	374	211	116	31
22	30	1.1	0.99	1.1	1.1	12	17	41	327	174	116	40
23	30	1.1	0.99	1.1	1.1	10	14	46	368	171	116	33
24	30	1.1	0.99	1.1	1.1	6.9	17	48	398	182	106	22
25	43	1.1	0.99	1.1	1.1	3.8	20	48	400	176	97	28
26	37	1.1	0.99	1.1	1.1	3.8	20	60	404	204	103	47
27	29	1.1	0.99	1.0	1.1	7.1	22	65	408	220	116	32
28	25	1.1	0.99	0.99	e1.1	9.4	20	73	406	209	150	32
29	29	1.1	0.99	0.99	---	9.3	22	111	404	183	147	26
30	32	1.1	0.99	0.99	---	9.0	22	175	398	172	133	32
31	34	---	0.99	0.99	---	9.2	---	118	---	204	152	---
TOTAL	977	405.5	31.25	31.71	29.60	161.06	635.3	2865	10343	8925	4298	1574
MEAN	31.5	13.5	1.01	1.02	1.06	5.20	21.2	92.4	345	288	139	52.5
AC-FT	1940	804	62	63	59	319	1260	5680	20520	17700	8530	3120
MAX	43	34	1.1	1.1	1.1	14	66	175	408	399	215	176
MIN	25	1.1	0.99	0.99	0.99	0.72	9.3	22	100	171	97	22
CAL YR	2010	TOTAL	17994.59	MEAN	49.3	MAX	358	MIN	0.55	AC-FT	35690	
WTR YR	2011	TOTAL	30276.42	MEAN	82.9	MAX	408	MIN	0.72	AC-FT	60050	

MAX DISCH: 410 CFS AT 09:30 ON JUN 27,2011 GH 3.18 FT SHIFT 0.12 FT

MAX GH: 3.18 FT AT 09:30 ON JUN 27,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CLEAR CREEK BELOW CLEAR CREEK RESERVOIR
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
07089250 COTTONWOOD CREEK NEAR BUENA VISTA
Water Year 2011

Location.--	Lat. 38°50'04", Long. 106°07'20", in NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$, sec. 16, T.14 S., R. 78 W., in Chaffee County, on left bank, about 1500 ft. upstream from Arkansas River, and 1200 ft. upstream from bridge at Buena Vista High School.
Drainage Area and Period of Record.--	109.24 sq.mi.
Equipment.--	Graphic water-stage recorder, satellite-monitored data collection platform and shaft encoder in a 42-inch corrugated metal pipe shelter and well. Primary reference gage is inside drop tape gage with adjustable RP on instrument shelf. Outside staff gage used for supplemental reference. On Dec 23, 2010 the Constant Flow Bubbler became the primary record sensor and the Stage Discharge Recorder was removed. No additional changes this water year.
Hydrologic Conditions.--	Cottonwood Creek is tributary to the main stem of the Arkansas River. The Cottonwood Creek basin is approximately 108 sq miles with a mean elevation of 10,900 ft. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except many low volume trail roads. The creek does flow through the town of Buena Vista and a small pond that is about one surface acre in size. In the fall this pond is drained and large amounts silt and sand are released to the creek filling most of the channel including the control. No hydrologic condition changes were apparent this water year.
Gage-Height Record.--	Primary record is fifteen minute satellite data. The record is complete and reliable, except for the following periods: Nov 23, 25-30, Dec 1-3, 2010; Jan 11, 2011; when ice affected the stage-discharge relationship, and Dec 30, 31 2010; Jan 1-5 2011 when the well was frozen and no effective GH was available.
Datum Corrections.--	Levels were last run on Sep. 19, 2011. Results were well within acceptable limits, so no corrections were made at that time.
Rating.--	The control is a concrete compound broad-crested with a center V- notch for low flows and a rectangular shape for higher flows. Rating No. 4, dated Mar. 25, 1996, was used the entire water year, and is well defined to about 676 cfs and remains valid with an average rating error of 4.95% over the last five years. Fifteen discharge measurements (Nos. 747-761) were made during the year. Measurements ranged in discharge from 0.84 to 215 cfs. They cover the range in stage experienced except for the lower daily flows of April 8-15; May 1, 2, 13-15, 21, 22, 2011 and the higher flow days of June 16-19, 23-30; July 1-3, 2011. The peak discharge of 343 cfs occurred at 0030 on July 1, 2011 at a gage height of 3.81 ft with a shift of 0.18 ft. It exceeded the mean stage of Measurement No. 757, made June 28, 2011 by 0.48 feet.
Discharge.--	Shifting control method was used for periods of good, ice-free record. Shifts were applied as defined by measurements and distributed by time for the entire water year. Many fill and scour events are assumed to cause varied shifts especially in the spring and fall when the city lake fills and releases. The control does appear to change slightly during these times of fill and scour therefore making it inadequate for a variable shift curve. Shifts ranged from -0.05 to +0.19 feet. All shifts were applied directly and given full weight, except Measurement No. 756 which was not used due to unknown inflow and outflow between measurement section and gage.
Special Computations.--	Estimation of discharge for periods of ice effect and no gage height were made using surrounding good record, partial day records, weather records and discharge measurements. A hydrograph was developed as a part of the record.
Remarks.--	Record is good, except during periods of ice effect or when the well was frozen, which are estimated and considered poor. Peak GH and discharge are rated good based on measurements and site visits during this time. Using the CFB as the primary record should continue as it appears to be providing better overall record especially during the winter months. Station maintained and record developed by Cheston Hart.
Recommendations.--	Continued use of the ADCP at high flows to better define upper end of rating. Additional research to understand inflows and outflows of this stream through town of Buena Vista would be beneficial. Continue to monitor Rating No. 4 for validity, especially at gage heights greater than 2.0 feet as the average rating error is near 7.5%.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07089250 COTTONWOOD CREEK NEAR BUENA VISTA

RATING TABLE-- COCRBVC004 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

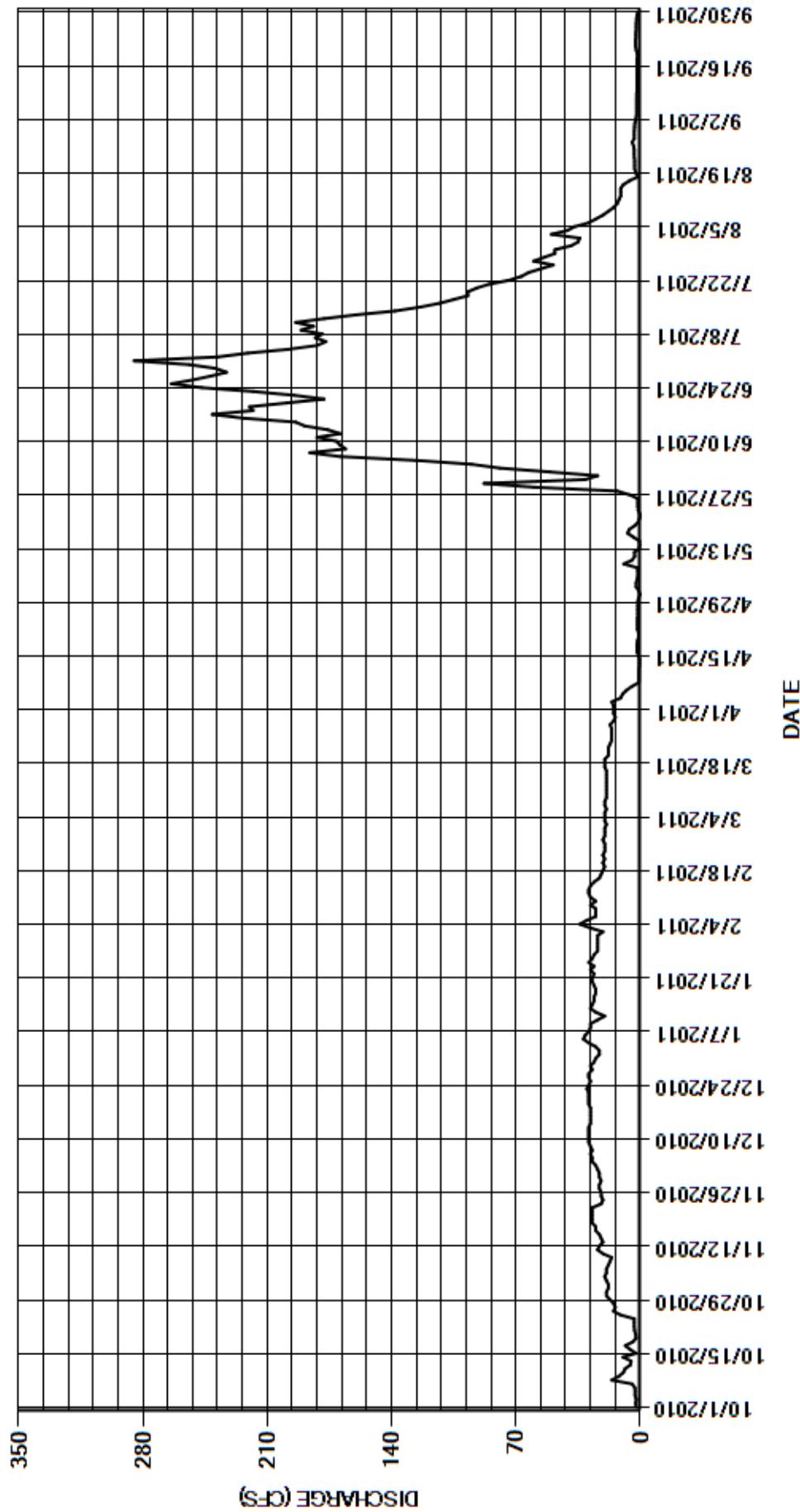
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.5	18	e23	e23	24	20	15	0.24	24	285	35	3.0
2	2.6	18	e24	e23	21	19	15	0.82	51	238	34	2.5
3	2.2	19	e25	e25	28	20	16	2.3	79	221	50	2.1
4	2.9	20	27	e29	34	20	11	2.3	95	198	41	2.0
5	2.8	19	27	e32	30	20	10	1.7	126	182	37	2.0
6	3.0	19	28	31	25	19	7.8	1.3	169	177	29	2.0
7	4.5	18	27	29	25	20	4.8	1.3	186	183	25	2.0
8	16	17	28	28	25	20	0.82	1.7	166	179	21	1.9
9	12	16	29	28	28	19	0.76	9.3	169	191	18	1.9
10	9.5	21	29	24	25	19	0.70	4.5	171	184	15	1.8
11	8.5	24	29	e20	28	19	0.67	3.1	182	194	13	1.7
12	5.5	23	29	25	29	19	0.61	3.3	169	178	12	1.7
13	5.2	21	29	28	29	19	0.55	0.63	176	160	11	1.7
14	9.7	22	28	27	28	19	0.44	0.33	189	138	11	1.7
15	2.4	23	28	26	26	19	0.81	0.53	194	124	11	1.8
16	5.7	25	28	26	23	19	1.8	3.9	223	113	9.4	1.8
17	8.4	25	28	25	22	20	1.8	7.1	241	105	6.0	1.8
18	4.1	27	28	25	21	20	1.9	6.2	218	97	1.4	1.7
19	2.3	27	29	26	20	20	1.5	3.0	220	97	2.4	1.6
20	2.6	27	29	27	21	18	0.84	1.1	199	92	3.1	2.2
21	3.2	27	29	27	20	18	1.0	0.36	178	85	3.1	2.6
22	3.3	27	29	26	21	18	1.6	0.30	195	74	3.1	2.7
23	3.4	e22	30	28	20	17	1.5	1.1	218	67	3.3	2.6
24	3.3	21	29	26	20	16	1.6	1.3	247	63	3.5	2.5
25	11	e22	28	29	20	16	1.5	1.3	264	56	3.4	2.4
26	15	e22	29	27	21	16	1.4	1.3	252	49	3.7	2.3
27	14	e23	29	26	20	16	1.5	5.8	242	60	4.5	2.2
28	15	e23	27	24	20	17	1.4	13	233	54	3.4	2.1
29	17	e22	28	24	---	15	1.4	60	239	48	3.4	1.9
30	19	e23	e26	24	---	14	1.0	88	254	48	3.3	1.4
31	19	---	e25	24	---	15	---	31	---	39	3.2	---
TOTAL	235.6	661	861	812	674	566	106.70	258.11	5569	3979	423.2	61.6
MEAN	7.60	22.0	27.8	26.2	24.1	18.3	3.56	8.33	186	128	13.7	2.05
AC-FT	467	1310	1710	1610	1340	1120	212	512	11050	7890	839	122
MAX	19	27	30	32	34	20	16	88	264	285	50	3.0
MIN	2.2	16	23	20	20	14	0.44	0.24	24	39	1.4	1.4
CAL YR	2010	TOTAL	10494.78	MEAN	28.8	MAX	317	MIN	0.88	AC-FT	20820	
WTR YR	2011	TOTAL	14207.21	MEAN	38.9	MAX	285	MIN	0.24	AC-FT	28180	

MAX DISCH: 343 CFS AT 00:30 ON JUL 01,2011 GH 3.81 FT SHIFT 0.18 FT

MAX GH: 3.81 FT AT 00:30 ON JUL 01,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07089250 COTTONWOOD CREEK NEAR BUENA VISTA
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
07091015 CHALK CREEK AT NATHROP
Water Year 2011

Location.--	Lat. 38°44'30", Long. 106°04'57", in SW $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 14, T.15 S., R.78 W., Chaffee County, on left bank, 640' north of the Junction of Co. Hwy. 162 and U.S. 285 on the frontage rd. parallel to U.S. 285, $\frac{1}{4}$ mi. south of Nathrop, Co., and 1 mi. west of the confluence of Chalk Creek and the Arkansas River.
Drainage Area and Period of Record.--	88.74 sq. mi.
Equipment.--	Graphic water-stage recorder, satellite-monitored data collection platform with shaft encoder in 32-inch diameter corrugated metal pipe (CMP) shelter and well with tipping bucket rain gage. Shaft encoder and SDR are set to the inside drop tape gage with adjustable RP on instrument shelf. Outside staff gage is also used for reference purposes. Control is a concrete dam, tapered lower towards the center, located approximately 5 feet downstream.
Hydrologic Conditions.--	Chalk Creek is tributary to the main stem of the Arkansas River. The Chalk Creek basin is approximately 88.5 sq miles with a mean elevation of 11,200 ft. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except many low volume trail roads. No hydrologic condition changes were apparent this water year.
Gage-Height Record.--	Primary record is 15-minute transmitted data with SDR log as backup. Record is complete and reliable except for the following periods: February 1-11: when ice formed in the well affecting float movement mainly at night; and, August 5, 2011 when there was more than 4 hours of missing data, unknown cause.
Datum Corrections.--	Levels were run on August 18, 2009. Results were well within acceptable limits, so no corrections were needed or taken.
Rating.--	The low concrete dam is the control at all stages, except at higher stages the webbed box culvert (~approx. 75 ft. downstream) under the highway will sometimes cause backwater and affect the rating. Rating No. 7 (dated Jan. 19, 2006) was used the entire water year. It is well defined to about 1000 cfs and remains valid with an average rating error of 4.80%. Eleven discharge measurements (Nos. 748-758) were made during the year. Measurements ranged in discharge from 5.10 to 224 cfs. They cover the range in flows experienced, except for higher daily flows of June 5-20, 22-30 and July 1-2, 2011 and a lower daily flow of April 13, 2011. The peak discharge of 430 cfs occurred at 0030 on June 7, 2011 at a gage height of 4.99 ft with a shift of 0.01 ft. It exceeded the mean stage of Measurement No. 755, made June 13, 2011 by 0.71 feet.
Discharge.--	Shifts were applied as defined by measurements and distributed by time for the entire water year. Measurements showed shifts ranged from 0.00 to +0.04 ft. All measurements were given full weight and shifts applied directly.
Special Computations.--	This site is fairly difficult to make a high water measurement in a typical year due to high velocity for wading and shallow conditions for bridge measurements. ADCP measurements have been attempted during high water but unfortunately this river has high sediment load causing inconsistent reading from the Acoustic equipment. People have continued to stack rocks above and below the control. Also beavers built small dams above the gage causing irregular approach angles to control. Before each measurement an attempt was made to remove debris from beavers and rocks that caused a change in the stream. Days of ice in the well were estimated using surrounding good days and weather data from the ARKWELCO gage. The SDR was incorrectly set up to collect data at less than 15-minute intervals thereby causing the memory to became full and did not supply backup data this water year.
Remarks.--	Record is considered good, except during periods of frozen well and missing data, which are poor. Peak gage height is rated good due to surround site visits and the peak discharge is rated fair based on lack of historical high water measurements. Station maintained and record developed by Cheston Hart.
Recommendations.--	Meet with landowners including nearby campground manager to discuss the issues of people moving rocks in the channel above and below the control.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07091015 CHALK CREEK AT NATHROP

RATING TABLE-- CHCRNAC007 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

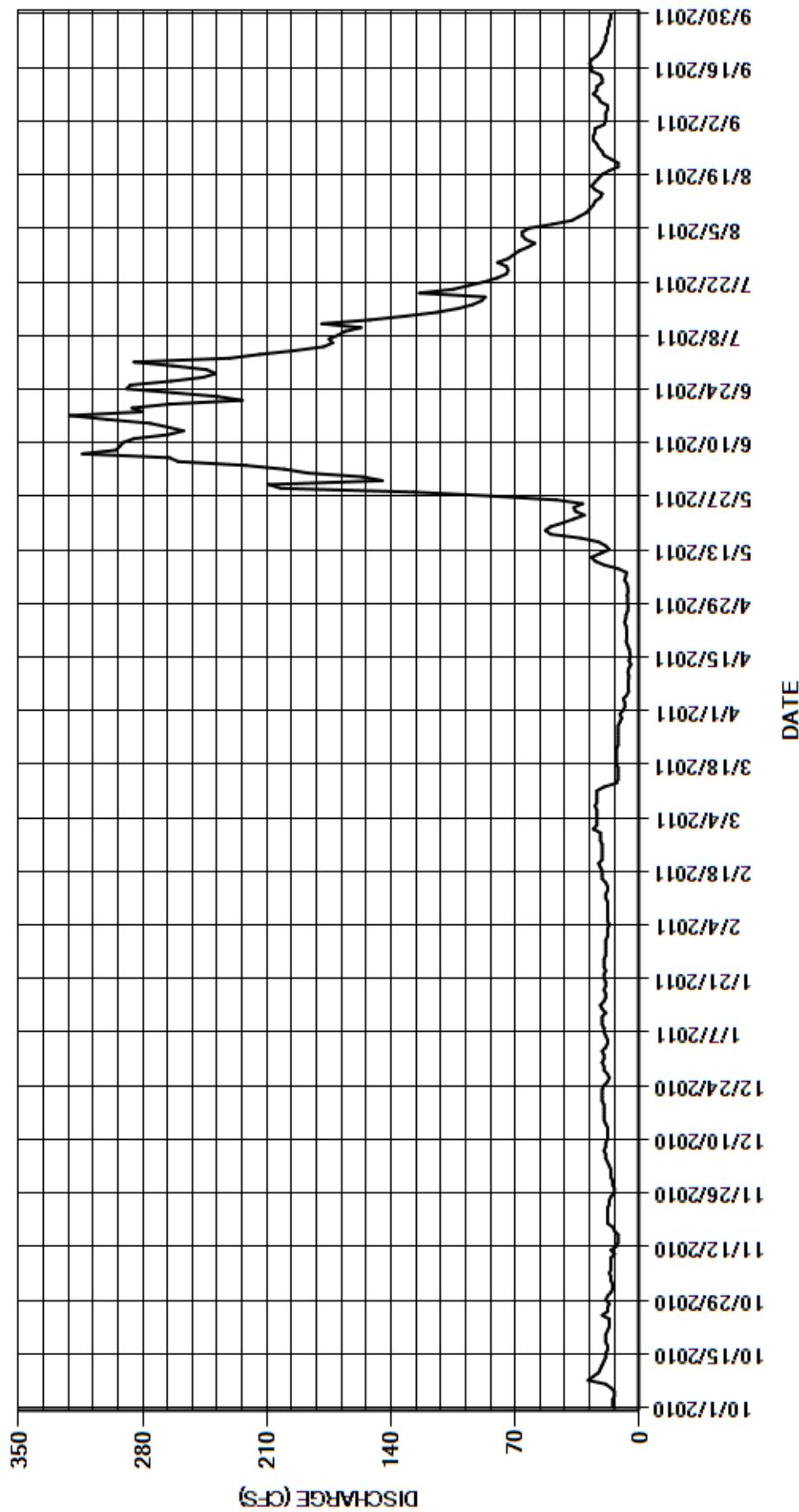
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	15	16	20	e18	26	9.3	6.9	156	285	59	20
2	15	15	16	21	e18	24	8.2	6.4	187	231	64	19
3	15	16	17	19	e18	24	8.3	6.6	200	214	66	19
4	14	16	18	18	e17	24	9.1	7.0	222	194	66	19
5	14	17	19	18	e18	24	7.1	8.4	260	178	e62	18
6	16	16	19	19	e18	24	6.1	7.7	265	173	49	18
7	19	16	20	20	e18	25	6.4	7.2	314	175	38	22
8	29	16	19	20	e18	24	6.3	12	295	170	34	23
9	26	16	19	21	e18	24	6.2	20	293	166	30	26
10	23	14	18	21	e18	24	6.0	25	291	157	28	24
11	22	16	18	21	e19	24	6.5	27	285	179	26	24
12	21	13	18	19	19	20	6.0	22	266	152	25	21
13	20	12	18	21	18	13	4.8	17	257	132	22	21
14	19	12	19	22	18	12	5.9	19	266	114	21	22
15	19	12	20	20	19	12	5.1	23	276	102	25	27
16	18	14	20	19	21	12	5.4	33	300	94	27	27
17	18	15	20	19	21	12	5.8	50	321	89	25	28
18	19	18	20	20	21	13	6.7	53	280	87	23	27
19	19	18	20	19	22	13	7.5	50	286	124	21	24
20	19	18	21	19	23	13	7.1	43	265	105	17	22
21	18	18	21	20	21	13	7.3	37	224	96	12	21
22	17	18	21	20	21	13	7.2	31	238	87	12	20
23	17	17	21	19	21	12	7.5	36	263	80	16	19
24	17	17	20	20	21	12	8.4	37	289	75	20	19
25	21	16	18	20	21	12	7.7	32	287	74	21	18
26	18	14	17	20	22	12	7.5	47	264	75	23	18
27	18	14	18	19	22	12	6.6	84	246	80	24	17
28	17	15	20	19	22	12	6.4	127	239	74	26	17
29	19	15	20	19	---	11	6.6	202	244	71	26	16
30	18	16	21	19	---	10	6.6	209	263	68	25	16
31	16	---	20	19	---	11	---	145	---	63	25	---
TOTAL	576	465	592	610	551	517	205.6	1431.2	7842	3964	958	632
MEAN	18.6	15.5	19.1	19.7	19.7	16.7	6.85	46.2	261	128	30.9	21.1
AC-FT	1140	922	1170	1210	1090	1030	408	2840	15550	7860	1900	1250
MAX	29	18	21	22	23	26	9.3	209	321	285	66	28
MIN	14	12	16	18	17	10	4.8	6.4	156	63	12	16
CAL YR	2010	TOTAL	17615.0	MEAN	48.3	MAX	567	MIN	12	AC-FT	34940	
WTR YR	2011	TOTAL	18343.8	MEAN	50.3	MAX	321	MIN	4.8	AC-FT	36380	

MAX DISCH: 430 CFS AT 00:30 ON JUN 07,2011 GH 4.99 FT SHIFT 0.01 FT

MAX GH: 4.99 FT AT 00:30 ON JUN 07,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07091015 CHALK CREEK AT NATHROP
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
07091500 ARKANSAS RIVER AT SALIDA
Water Year 2011

Location.--	Lat. 38°32'45", Long. 106°00'36", in NE $\frac{1}{4}$ sec. 31, T.50 N., R.9 E., Chaffee County on right bank at Salida, 450 ft. upstream from bridge on State Highway 291, and 2.7 mi. upstream from South Arkansas River.
Drainage Area and Period of Record.--	1,218 mi ² .
Equipment.--	Graphic water-stage recorder, satellite-monitored data collection platform (High data rate DCP transmitter) and shaft encoder in a 4 ft x 4 ft steel shelter placed over a CMP stilling well. Shaft encoder and chart set to inside drop tape from an adjustable RP on instrument shelf. Cableway approximately 35 feet downstream from gage. No changes this water year.
Hydrologic Conditions.--	The Arkansas River at Salida is located below Twin Lakes, Turquoise Lake and Clear Creek Reservoirs. The flow conditions are subject to releases from these lakes as well as native flows of tributary creeks. Natural drainage area is approximately 1200 sq miles with a mean elevation of 10300 ft. The basin consists of high mountain terrain some of which is above tree line.
Gage-Height Record.--	The primary record is fifteen minute DCP log data with a chart record used for back-up. Record is complete and reliable, except for the following periods: Feb 8-10, 24-27, 2011, when the stilling well was frozen with no effective GH; June 25-July 8 and July 15-July 29, 2011 when the bead came off the shaft encoder wheel. Faulty GH data were replaced during these periods using chart data with no loss of accuracy.
Datum Corrections.--	Levels were last run on Feb 26, 2009. The drop tape was adjusted due to the RP being moved when the shelf was replaced.
Rating.--	The control consists of placed boulders 80 ft downstream of gage which affect flow at all ranges of stage. Heavy brush on both banks also affects flows at high stages. Rating No. 30, dated August 26, 2009 was used for entire water year. It is well defined to about 3500 cfs and remains valid with an average rating error of -0.78%. Fifteen discharge measurements (Nos. 441 to 455), ranging in discharge from 264 to 3510 cfs, were made during the water year. They cover the range in stage experienced, except lower flow days of Oct 1, 3, 4 2010; Mar 26-31; Apr 1-18 2011 and higher days of Jun 26-29, July 1-3, 9-12 2011. The peak discharge of 3930 cfs occurred at 0415 on July 10, 2011 at a gage height 6.28 ft with a shift of 0.10 ft. It exceeded maximum flow Measurement No. 451, made July 8, 2011 by 0.36 ft. in stage.
Discharge.--	Shifting control method was used for the entire water year record. Shift distribution was made on a time basis for the entire water year. Site visit and measurements show the placed rock riffle appears to be unstable and moving causing control changes throughout the year. Measurements indicated shifts varying from -0.07 to +0.12 ft. Due to the high water conditions this water year considerable scour and fill was witnessed. All shifts were given full weight and applied directly, except for Measurement No.450, which was discounted -0.30% to smooth shift distribution.
Special Computations.--	Estimates of flow during ice affected periods were made based on good record prior to, during, and after such periods, measurements, and a hydrographic comparison to upstream and downstream gages: Arkansas River at Granite and Arkansas River near Wellsville, respectively.
Remarks.--	Record good, except for those periods of ice affected record, which are estimated and poor. Peak gage height and discharge are rated good based on related measurements and site visits. Station maintained and record developed by Cheston Hart.
Recommendations.--	Continue use of the ADCP to will prove its reliability at this site. Main issue with the usage of the ADCP at this site is the location of cable way to the control. At all levels there is an issue with the distance between the cable car and control, either the boat floats into the control boulders or when attempting to avoid the boulders the tag line becomes too short and lifts the ADCP sensor out of the water. This water year a weight was hung from the A reel, so the boat can be held closer to the cable car also helping with the angle of the boat.

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07091500 ARKANSAS RIVER AT SALIDA

RATING TABLE-- ARKSALCO30 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

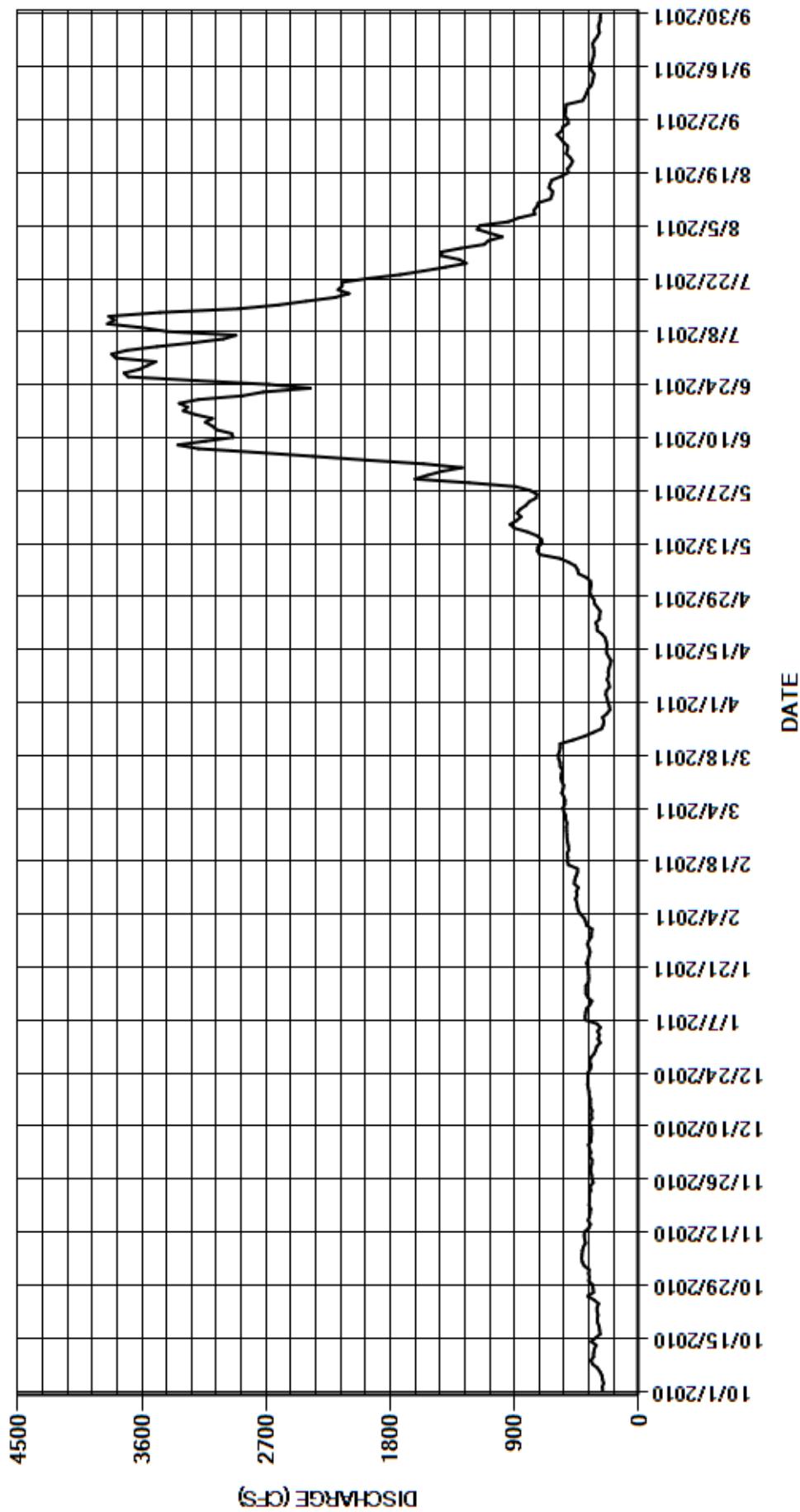
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	261	363	338	279	378	529	224	352	1430	3790	1090	511
2	264	359	357	295	385	528	229	344	1280	3820	989	514
3	254	395	347	285	397	543	239	350	1560	3710	1080	536
4	263	409	355	298	423	550	235	381	1980	3490	1170	531
5	267	414	364	278	439	536	212	437	2360	3230	1150	528
6	281	411	344	303	445	534	217	443	2760	3010	944	525
7	299	409	345	387	449	543	229	459	3190	2920	871	407
8	334	401	342	388	e458	558	219	508	3340	3420	753	391
9	346	386	342	385	e447	549	221	572	3140	3600	760	379
10	327	392	350	378	e452	544	216	717	2940	3850	739	368
11	327	396	357	354	438	557	206	734	2950	3800	728	344
12	322	392	339	340	467	564	201	731	3060	3840	640	335
13	308	362	344	370	464	560	218	700	3090	3470	629	330
14	344	350	339	384	455	552	233	705	3140	2900	624	323
15	311	367	350	384	444	569	234	738	3090	2610	650	342
16	279	357	352	384	444	569	230	805	3210	2410	642	349
17	284	353	350	365	510	580	236	901	3300	2200	630	340
18	287	348	359	362	517	584	244	932	3270	2100	563	333
19	298	359	360	364	515	574	266	886	3330	2180	511	325
20	301	358	366	366	520	569	302	853	3190	2150	517	324
21	295	356	371	368	507	570	301	882	2870	2150	493	328
22	302	357	368	377	510	476	312	859	2720	1960	479	335
23	302	347	370	367	516	393	284	819	2380	1730	497	320
24	291	353	368	360	e520	330	284	794	2680	1560	526	299
25	324	330	352	352	e522	269	279	743	3200	1400	517	285
26	370	338	344	361	e523	257	298	739	3700	1250	515	290
27	327	341	355	372	e525	253	320	790	3730	1300	545	291
28	331	349	348	362	520	262	323	895	3620	1430	566	281
29	335	347	325	343	---	230	343	1230	3560	1430	593	279
30	362	340	312	343	---	209	354	1620	3500	1290	558	277
31	358	---	304	338	---	214	---	1530	---	1120	551	---
TOTAL	9554	11039	10817	10892	13190	14555	7709	23449	87570	79120	21520	11020
MEAN	308	368	349	351	471	470	257	756	2919	2552	694	367
AC-FT	18950	21900	21460	21600	26160	28870	15290	46510	173700	156900	42680	21860
MAX	370	414	371	388	525	584	354	1620	3730	3850	1170	536
MIN	254	330	304	278	378	209	201	344	1280	1120	479	277
CAL YR	2010	TOTAL	212294	MEAN	582	MAX	4590	MIN	160	AC-FT	421100	
WTR YR	2011	TOTAL	300435	MEAN	823	MAX	3850	MIN	201	AC-FT	595900	

MAX DISCH: 3930 CFS AT 04:15 ON JUL 10,2011 GH 6.28 FT SHIFT 0.1 FT

MAX GH: 6.28 FT AT 04:15 ON JUL 10,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07091500 ARKANSAS RIVER AT SALIDA
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
07093700 ARKANSAS RIVER NEAR WELLSVILLE
Water Year 2011

Location.--	Lat. 38°30'10", Long. 105°56'21", in SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 14, T.49 N., R.9 E., Chaffee County, Hydrologic Unit 11020001, on right bank 50 ft upstream from Chaffee-Fremont County line, 2.0 mi northwest of Wellsville, 2.8 mi downstream from South Arkansas River, and 3.5 mi southeast of Salida.
Drainage Area and Period of Record.--	1,485 mi ² . April 1961 to current year.
Equipment.--	Station is equipped with a high data rate satellite-monitored data collection platform with a Constant Flow Bubbler (CFB). The CFB is referenced using an outside horizontal chain weight gage. Cableway located 400 feet downstream from gage. A new cable was installed for the cableway this year.
Hydrologic Conditions.--	The Arkansas River near Wellsville is located below Twin Lakes, Turquoise Lake and Clear Creek Reservoirs. The flow conditions are subject to releases from these lakes as well as native flows of tributary creeks. Natural drainage area is approximately 1485 sq miles with a mean elevation of 10,200 feet. The basin consists of high mountain terrain some of which is above tree line.
Gage-Height Record.--	The primary record is 15-minute satellite-monitored data with the DCP and CFB logs used as back-up. Record is complete and reliable, except for the following periods: Jan 1-4; Feb 3, 4, 9, 10, 2011, when gage height was affected by ice.
Datum Corrections.--	Levels were run Sept 12, 2007. No adjustments were needed or taken.
Rating.--	Control is a rock riffle about 90 ft downstream. High water control is channel and rock banks. Rating No. 6A, dated Dec. 20, 1993 (extended on Dec. 30, 2002), was used this water year and it remains valid with an average rating error of 2.28%. It is well defined from about 170 to 5500 cfs. Fourteen discharge measurements (Nos. 939-952) were made during the water year ranging in discharge from 303 cfs to 3540 cfs. They cover the range in flows experienced except for the lower daily flows of Oct 1, 3; Mar 28-31; Apr 1-19, 2011 and the higher daily flows of Jun 7-9, 14, 16-20, 25-30; Jul 14, 8-13, 2011. The peak flow of 4330 cfs occurred at 0830 June 27, 2011 at a gage height of 7.23 ft with a shift of +0.17 ft. It exceeded mean gage height of Measurement No. 949, made July 8, 2010 by 0.45 ft. in stage.
Discharge.--	Shifting control method used the entire year. All shifts were distributed and applied by time proration except for the period April 21, 2011 at 10:30 to September 16, 2011 at 11:00 when variable shift curve ARKWELCOVS11 was implemented. Measurements show shifts varying from -0.04 to +0.15 ft. All were given full weight and applied directly, except Measurement Nos. 945, 947, 948, 950, and 951 which were discounted from -0.36% to -4.11% to smooth shift distribution. Changing stream conditions throughout the year included heavy moss and channel scour/fill.
Special Computations.--	For comparison, the station Arkansas River at Salida, located 2.5 miles upstream, was plotted on the same hydrograph. Initially, the record for Arkansas River at Salida is worked, determining flows for ice-affected days there. Then, flows for missing/ ice affected/ suspect days at Arkansas River near Wellsville can be estimated from that data, as there is a reasonable correlation that exists between the two stations. There are no known withdrawals from the river between these two stations; only inflows, especially from the South Arkansas River. After preliminary shifting and daily flows are plotted for both gages, if the Salida plot line crosses over the Wellsville line (or vice-versa), then shifts are adjusted until there is at least some separation between the two, since there is always, on a daily basis, more flow at Wellsville than Salida.
Remarks.--	Record good, except for periods of ice affected record, which are estimated and poor. Peak GH and discharge are rated good based on related measurements and site visits. The new cable on the cableway was installed and used in WY11. Station maintained and record developed by Cheston Hart.
Recommendations.--	Preventative maintenance on outside horizontal chain gage should be performed.

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07093700 ARKANSAS RIVER NEAR WELLSVILLE

RATING TABLE-- ARKWELCO06A USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

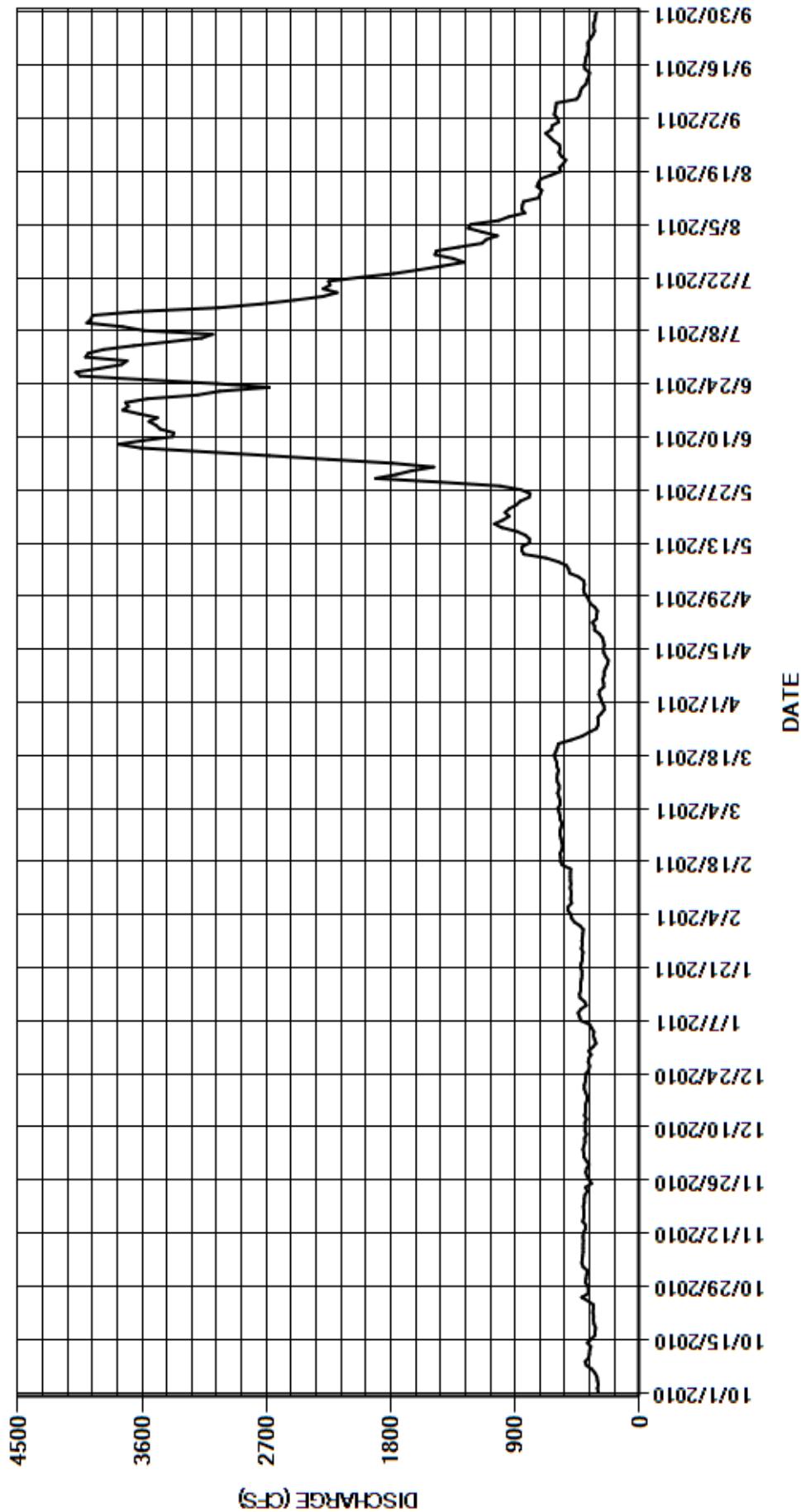
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	299	383	385	e315	431	574	273	405	1650	4010	1110	585
2	305	376	403	e325	473	575	281	399	1490	3990	1030	595
3	298	408	403	e335	e492	583	293	404	1790	3880	1140	617
4	305	418	409	e330	e498	591	290	440	2250	3660	1240	610
5	308	415	402	346	517	574	259	507	2680	3410	1220	606
6	322	412	395	363	517	574	260	513	3140	3170	1020	602
7	344	408	397	426	492	583	267	528	3610	3090	946	457
8	384	408	384	434	499	593	256	589	3770	3590	831	435
9	394	408	395	445	e496	583	257	676	3590	3740	852	429
10	369	407	394	424	e495	582	245	837	3380	4000	848	417
11	363	410	396	386	503	595	232	853	3370	3970	841	387
12	361	406	384	398	496	598	226	849	3470	3960	730	381
13	353	392	398	431	501	594	245	797	3500	3630	719	368
14	377	390	390	435	502	586	259	796	3550	3050	708	362
15	349	411	390	425	500	598	262	826	3490	2740	742	396
16	322	404	390	426	499	597	256	887	3620	2500	731	400
17	322	402	380	426	559	609	262	996	3740	2290	715	392
18	318	404	379	420	572	618	269	1050	3700	2190	640	389
19	330	407	390	416	571	605	291	989	3720	2290	572	377
20	334	400	400	416	577	594	326	944	3560	2240	580	372
21	332	400	400	427	563	587	325	973	3200	2250	551	373
22	338	396	392	423	557	496	341	943	3040	2030	534	374
23	335	377	390	413	563	416	311	892	2680	1780	567	355
24	334	391	387	415	569	367	311	863	3060	1600	583	337
25	371	348	368	409	576	313	305	800	3570	1430	575	326
26	418	364	361	421	576	300	323	792	4050	1270	581	332
27	370	381	371	414	568	298	357	859	4080	1350	619	331
28	370	389	367	417	561	302	369	1010	3910	1480	648	321
29	376	383	351	413	---	277	384	1440	3750	1470	679	319
30	393	366	368	411	---	255	403	1910	3710	1310	638	312
31	387	---	338	407	---	258	---	1760	---	1140	633	---
TOTAL	10781	11864	11957	12492	14723	15675	8738	26527	98120	82510	23823	12557
MEAN	348	395	386	403	526	506	291	856	3271	2662	768	419
AC-FT	21380	23530	23720	24780	29200	31090	17330	52620	194600	163700	47250	24910
MAX	418	418	409	445	577	618	403	1910	4080	4010	1240	617
MIN	298	348	338	315	431	255	226	399	1490	1140	534	312
CAL YR	2010	TOTAL	240818	MEAN	660	MAX	5110	MIN	210	AC-FT	477700	
WTR YR	2011	TOTAL	329767	MEAN	903	MAX	4080	MIN	226	AC-FT	654100	

MAX DISCH: 4330 CFS AT 08:30 ON JUN 27,2011 GH 7.23 FT SHIFT 0.17 FT

MAX GH: 7.23 FT AT 08:30 ON JUN 27,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07093700 ARKANSAS RIVER NEAR WELLSVILLE
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
07095000 GRAPE CREEK NEAR WESTCLIFFE
Water Year 2011

Location.--	Lat. 38°11'10", Long. 105°29'02" (Westcliffe, Colorado quadrangle, 1:24000 scale) in NW¼, NW¼, Section 31, T21S, R72W, Custer County, Hydrologic Unit 11020001, on left bank 0.5 mi upstream from waterline of DeWeese Reservoir at elevation 7690 ft, 0.5 mile downstream from Swift Creek, and 3.6 mile NW of Westcliffe CO.
Drainage Area and Period of Record.--	320 square miles (furnished by Corps of Engineers). April 1, 1925-June 30, 1928; April 1, 1930-Sept 30, 1961; Oct 1, 1962 to present.
Equipment.--	Graphic water stage recorder, shaft encoder, and satellite monitored data collection platform (Sutron Model 8210 DCP with HDR GOES radio) in a 48-inch diameter metal pipe (CMP) shelter and well. Primary reference gage is an electric drop tape inside the well. No outside staff gage. The control is a compound, broad-crested weir located 17 ft. downstream from the gage. An air temperature sensor, installed in radiation shield, and a tipping bucket raingage are also installed at the gage and monitored by the DCP. No changes this water year.
Hydrologic Conditions.--	The gage is located on Grape Creek approximately 3000 ft upstream of the high water line of DeWeese Reservoir. Grape Creek is one of two major creeks draining the Wet Mountain Valley. The gage is located downstream of approximately 15,000 acres of grass hay and pasture fields in the south and central portions of the valley. The gage is at elevation 7690 ft MSL with a drainage area consisting of the high mountain valley and east slope of the Sangre de Cristo mountains which rise to elevations of 12,000 ft to over 14,000 ft. Snowpack and snowmelt runoff, and summer thunderstorms dictate the shape and volume of the annual streamflow hydrograph. Peak runoff often occurs in the spring (late March-late May) due to high elevation snowmelt or melt of very wet (and often deep) spring snows in the valley. As a result of irrigation diversions, streamflows at the gage can generally be low during late May to late August, but often flashy peaks during this period are experienced due to intense summer thunderstorms.
Gage-Height Record.--	Primary record is 15-minute satellite data with the graphic chart record and DCP log data used for backup purposes. Record is complete and reliable, except for the following periods: October 27-28, 31, November 11-18, 22-30, December 1-9, 12-14, 18, 19, 26-31, 2010, Jan 1, March 9-10, 2011, when the stage-discharge relationship was affected by ice on the control; January 2-31, February 1-28, March 1-7, 2011, when either the chart floats were frozen in ice in the well, or, the well was frozen, intakes were frozen, and the control/weir pool was frozen over, or both. Missing satellite data values from 0630 Mar 10 to 1215 Mar 11, 2011 were replaced with values from the DCP data log file without loss of accuracy. A single 15-minute value of 0.00 ft gage height recorded at 0645 on Sept 21, 2011, was replaced with backup chart record data without loss of accuracy. A rock dam built on the left edge of the weir control was found and removed at 1330 on July 29, 2011. It is estimated the rock dam was built beginning around 1830 July 13. Thus, the gage height record from 1830 July 13 to 1330 July 29 was affected by backwater from this dam.
Datum Corrections.--	Levels were last run August 10, 2010 to the electric tape index using RM No. 1 as base. No corrections were necessary as the electric tape index elevation was found to be within allowable tolerances.
Rating.--	The control is a compound, broad-crested weir located 17 feet downstream from the gage. The PZF on the weir is gage height of approximately 0.30 ft. There is an approximately 6-foot wide section where the concrete has broken out on the downstream edge of the weir near the center. At high stages (greater than 3.00 ft gage height), the flow will go overbank on the right side of the weir, and the control includes grass-lined banks and secondary channel on right bank. Rating No. 9, in use since October 6, 2005, was continued in use for all of WY2011. It is well-defined to flows of about 525 cfs, 150% of the historical highest discharge measurement made in WY2007. Seventeen discharge measurements (Nos. 271-287) were made during the year, ranging in discharge from 3.08 to 25.5 cfs. They cover the range in stage experienced except the lower daily flows of June 28, July 6, 24-28, 2011; and the higher daily flows of April 25-26, 2011. The peak flow of 175 cfs occurred at 2345 on July 29, 2011 at a gage height of 1.67 ft with a shift of 0.00 ft. It exceeded the stage of high flow measurement No. 274, made Dec 8, 2010, by 0.92 feet.
Discharge.--	Shifting section control method was used for all periods of good record as the range in stage experienced this year was confined to the weir section for all periods of good record. Shifts were applied as defined by measurements and were distributed by time, with consideration of stage change, for the entire water year. Open water measurements showed raw shifts varying between -0.02 ft and 0.00 ft. All open water measurements were given full weight, except Msmt 272 was discounted -8% to smooth shift distribution.
Special Computations.--	Discharge for periods of ice-affected record was estimated on the basis of 3 measurements (Nos. 275-277), and air temperature data collected at the gage. A hydrograph was used. A -0.04 ft gage height change was found with the rock dam removal at 1330 on July 29. This was applied as a shift correction for the period the rock dam was estimated to be in place: 1830 Jul 13 to 1330 Jul 29.
Remarks.--	Record is good, except for periods of ice effect and no gage height record, which are estimated and poor; and the period when the rock dam was affecting the control, which is fair. The peak gage height and discharge are considered good. Station maintained and record developed by Thomas W. Ley
Recommendations.--	The concrete weir continues to degrade, experiencing spall damage on the crest due to ice. The peak runoff event on Mar 31, 2010 caused additional damage on the right edge of the weir. A weir refurbishment project should be planned and implemented.

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07095000 GRAPE CREEK NEAR WESTCLIFFE

RATING TABLE-- GRAWESCO09 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

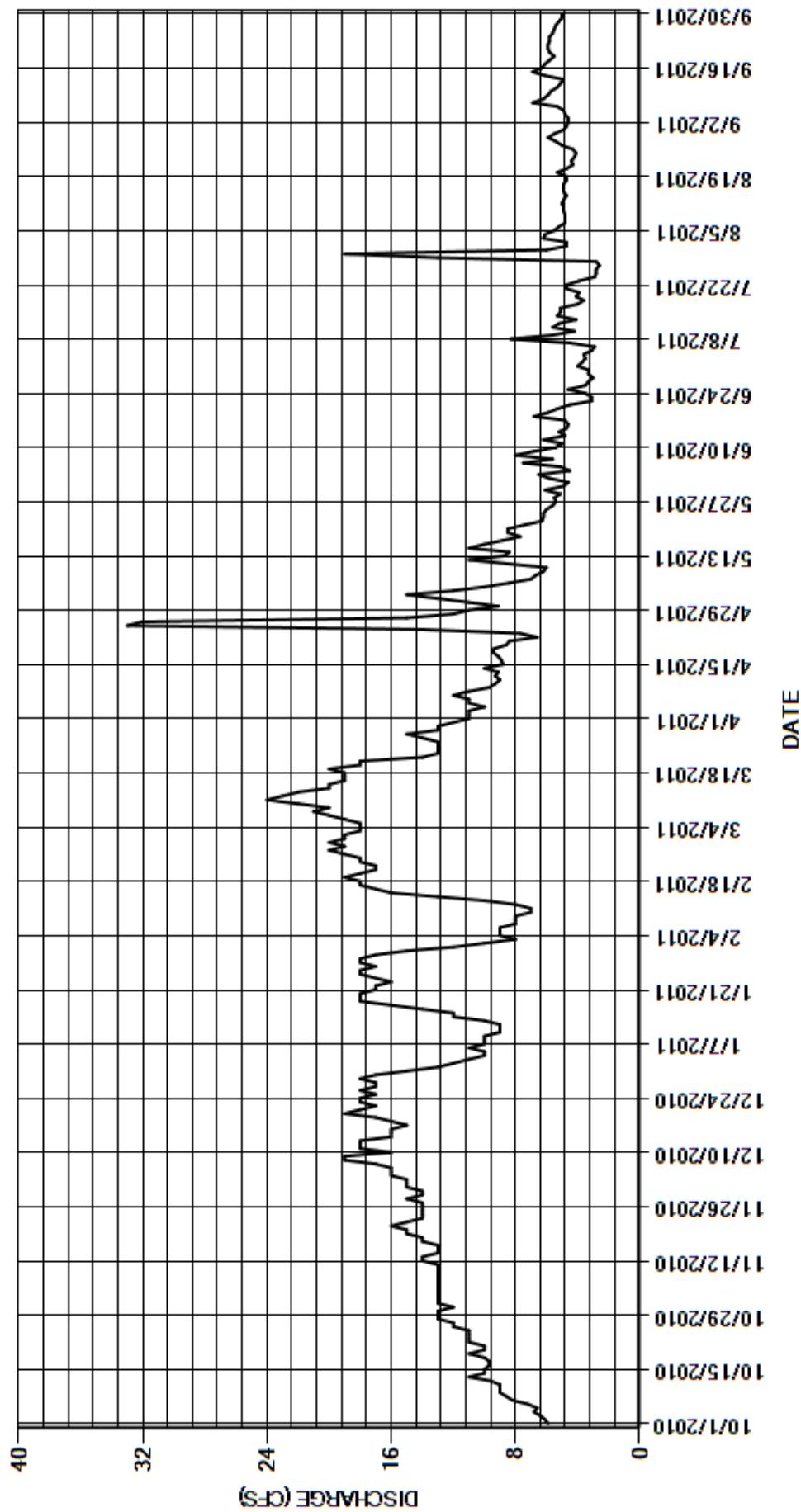
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.9	13	e15	e13	e12	e19	11	11	4.6	4.0	4.7	4.7
2	6.1	13	e15	e12	e10	e19	11	13	5.8	3.7	4.7	4.6
3	6.4	13	e15	e11	e8.0	e18	11	15	6.5	3.5	6.2	4.6
4	6.8	13	e16	e10	e9.0	e18	10	12	4.5	3.6	6.1	4.8
5	6.6	13	e16	e10	e9.0	e18	11	10	5.1	3.1	5.5	4.9
6	7.2	13	e16	e11	e9.0	e19	11	8.4	7.5	2.9	5.2	5.3
7	8.2	13	e17	e10	e8.0	e20	12	7.0	5.6	4.5	4.8	6.9
8	8.6	13	e19	e10	e8.0	21	11	6.7	8.0	8.3	4.8	6.2
9	9.0	13	e19	e10	e8.0	e20	9.7	6.2	6.8	5.6	4.8	5.9
10	9.0	13	16	e9.0	e7.0	e22	9.3	6.0	5.4	4.2	4.9	5.7
11	9.0	e13	18	e9.0	e7.0	24	9.0	8.6	5.0	5.6	4.9	5.3
12	9.6	e14	e18	e9.0	e8.0	23	9.3	11	6.2	5.2	5.0	5.1
13	11	e14	e18	e10	e10	22	9.1	8.7	4.8	4.1	4.9	4.9
14	10	e13	e16	e12	e13	20	10	8.4	5.2	5.3	4.7	6.1
15	10	e13	16	e12	e16	20	8.8	11	4.7	5.1	4.9	6.9
16	9.7	e13	16	e14	e17	19	8.9	10	4.6	5.1	4.9	6.3
17	9.7	e14	15	e16	e18	19	9.1	8.8	4.8	4.0	4.9	6.1
18	10	e14	e16	e18	e18	19	9.4	7.7	6.8	3.6	4.7	5.8
19	11	15	e17	e18	e19	20	9.4	8.5	5.9	4.1	4.7	5.5
20	10	15	19	e18	e18	18	8.6	8.5	5.3	3.9	5.3	5.8
21	10	16	18	e17	e17	18	8.4	7.4	4.5	4.7	4.7	5.9
22	11	e15	17	e17	e17	14	6.6	6.3	3.1	4.7	4.3	5.9
23	11	e14	18	e16	e18	13	7.7	6.2	3.1	3.9	4.4	5.8
24	11	e14	18	e17	e18	13	14	6.2	3.5	2.9	4.2	5.8
25	11	e14	17	e18	e19	13	33	6.0	4.6	2.8	4.1	5.6
26	12	e14	e18	e18	e20	13	32	5.6	3.5	2.8	4.3	5.5
27	e12	e14	e17	e17	e19	14	15	5.4	3.3	2.6	5.0	5.4
28	e13	e15	e17	e18	e20	15	12	5.5	3.0	2.8	5.4	5.2
29	13	e14	e18	e18	---	13	11	5.1	3.3	13	5.9	5.0
30	13	e14	e17	e17	---	13	9.1	6.1	3.3	19	5.5	5.0
31	e12	---	e15	e15	---	12	---	4.9	---	6.0	4.9	---
TOTAL	302.8	412	523	430.0	380.0	549	347.4	251.2	148.3	154.6	153.3	166.5
MEAN	9.77	13.7	16.9	13.9	13.6	17.7	11.6	8.10	4.94	4.99	4.95	5.55
AC-FT	601	817	1040	853	754	1090	689	498	294	307	304	330
MAX	13	16	19	18	20	24	33	15	8.0	19	6.2	6.9
MIN	5.9	13	15	9.0	7.0	12	6.6	4.9	3.0	2.6	4.1	4.6
CAL YR	2010	TOTAL	10615.2	MEAN	29.1	MAX	478	MIN	4.3	AC-FT	21060	
WTR YR	2011	TOTAL	3818.1	MEAN	10.5	MAX	33	MIN	2.6	AC-FT	7570	

MAX DISCH: 175 CFS AT 23:45 ON JUL 29,2011 GH 1.67 FT SHIFT 0 FT

MAX GH: 1.67 FT AT 23:45 ON JUL 29,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07095000 GRAPE CREEK NEAR WESTCLIFFE
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
07096000 ARKANSAS RIVER AT CAÑON CITY
Water Year 2011

Location.--	Lat. $38^{\circ}26'02''$, Long. $105^{\circ}15'24''$, in SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 31, T.18 S., R.70 W., Fremont County, Hydrologic Unit 11020002, on right bank 800 ft upstream from Sand Creek, 0.7 mi downstream from Grape Creek, and 0.7 mi upstream from First Street Bridge in Canon City.
Drainage Area and Period of Record.--	3,060 mi ² . January 1888 to current year. Monthly data only for some periods. Published as near Canyon 1900-1906.
Equipment.--	A float controlled Sutron shaft encoder logged and transmitted with a Satlink 2 data collection platform in a 4-ft x 4-ft steel outhouse-type shelter over a 42-inch stilling well. Backup data is logged by an independently float controlled Sutron SDR. Primary reference gage is electric drop tape in the stilling well. Water temperature and specific conductance is monitored by the USGS and logged and transmitted with the Satlink 2. Equipment modifications for this water year include: static tube 90 degree bend removed October 8, 2010. No other changes. A manned cableway is positioned 25 feet downstream from gage. Control is a 2-stage diversion dam for the Canon City Water Works pump station (diversion structure #503) located approximately 250 ft downstream of the gage.
Hydrologic Conditions.--	The drainage basin above the gage encompasses approximately 3,060 square miles. Basin characteristics include elevation differences from Mt. Elbert at 14,433 ft to the gage at elevation 5,361 ft with vegetation ranging from alpine tundra to sparse pinon-juniper. Upstream from the gage, the Arkansas River is characterized by steep gradient, high velocity flows that are confined to a relatively narrow rock and cobble stream channel. The gage is located downstream of the Royal Gorge bridge 3.10± miles and is 0.7± miles downstream of Grape Creek inflows. Streamflow exhibits considerable seasonal variability with the majority of the total annual streamflow resulting from snowmelt runoff with high intensity – short duration summer thunderstorms contributing in the minor. Mean annual precipitation for the basin is 18.02± inches. Flow varies seasonally due mainly to snowmelt in the Sawatch Range. Snowmelt generally runs from May through July and peak flows typically occur during this period. Flows can also be affected by thunderstorm runoff and flash flooding on upstream tributaries during the summer months. Otherwise flows are affected by regulation of upstream reservoirs. Upstream diversions, Hydraulic and South Canon ditches, affect flows and often cause flows at the gage to be lower than those at the upstream Parkdale gage. No hydrologic conditions changes in the basin observed this water year.
Gage-Height Record.--	Primary record is 15-minute satellite-monitored shaft encoder data, with DCP log and the Stage Discharge Recorder log as backup. Record is complete and reliable, except for the following periods: Dec. 30-31, 2010; Jan. 1-9, 12-19, 30-31; Feb 1, 3-7, 12-14, 2011, when the stage discharge relationship was affected by ice on the control and each bank; Jan 11-12, Feb 2-3, 8-11, 2011, when the floats were frozen in ice inside the stilling well. During cold periods (typically overnight lows less than 10° F), ice has been observed to form on the 2nd stage weir, each bank and surrounding boulders and creates ice-affected backwater conditions at the gage. On December 6, 2010, 3 unit values of satellite data were missing due to USGS HydroLab maintenance. Missing values were filled in from adjacent good record values without loss of accuracy - given the short time period and gage height stability. Primary and backup stage sensor calibration to reference gage is supported by 25 visits made to the gage this water year. Numerous flush corrections were made this year and applied in the record by time proration from previous calibration visit.
Datum Corrections.--	No survey levels were completed this water year. Levels were last run Aug 30, 2010. No corrections were necessary.
Rating.--	The 1st stage of the control consists of a grouted riprap whitewater bypass chute, approximately 13 ft wide, with sloped sides, and a concrete sill with a point of zero flow at approximately 3.65 ft, gage datum, according to construction plans. Flow through the chute appears to go through critical depth at most stages but could be subject to submergence due to downstream obstructions. The whitewater bypass was cut into the original ogee weir around 1993. The 2nd stage control consists of an ogee weir, about 65 ft wide and with a crest elevation of about 4.90 ft, gage datum. Boulders were grouted to the downstream face of the weir during the 1993 work. The weir and whitewater bypass have vertical abutments up to a gage height around 12 feet above which the channel banks would become part of the control. At a gage height of approximately 14-ft, flows would spill into floodplains. Rating No. 23, implemented on November 6, 2003, was used all water year. The rating is well-defined by 162 historical measurements ranging from 171 cfs to 4320 cfs with approximately 55% of the historical measurements falling to the left of the rating curve (negative shift) and 45% falling to the right of the curve (positive shift). Rating No. 23 remains applicable given that the percent error between the measured values and the un-shifted rating curve (R-Error) averages 1.80% for measurements this water year and 1.20% when the high and low gage height measurements are discarded from the data set. Twenty three discharge measurements (Nos. 742-764) were made this water year ranging from 237 cfs (5.19 ft) to 3620 cfs (8.69 ft). WY2011 measurements covered the range in stage experienced except for the lower daily flows of October 1-6, 2010, April 11-19, 2011 and the higher daily flows of June 8, 26-29, July 1-4, 10-13, 2011. The peak instantaneous flow of 4110 cfs occurred at 1145 on July 2, 2011 at a gage height of 9.00 ft with a shift of +0.25 ft. It exceeded high measurement no. 759, made June 17, 2011, by 0.31 feet in stage.
Discharge.--	Shifting control method was used to compute discharge for the entire water year. Shifts were applied as defined by measurements and distributed by time, event and stage. Shifts were distributed by time proration from the beginning of the water year to the start of the ascending limb of the first peak runoff event at 1900 May 29, 2011 when gage height began to exceed 6.80 ft. From this point, variable shift curve ARKCANCOVSC11A, based on Msmts 758-761, was applied to the record period when gage heights exceeded 6.80 ft until the descending limb of the rain event at 1000 July 30, 2011. VSC11A is defined at the low end with a 0.00 shift at gage height 6.80 ft where it joins base Rating 23. It is open ended at the upper end with a shift of +0.25 ft at the peak gage height of 9.00 ft. Shifts were again distributed by time proration from 1015 Jul 30 to the end of the water year. Open water measurements showed shifts ranging from -0.07 to +0.26 ft. Measurements 758, 760 and 761 were discounted from -5 to +1% for smoothing purposes. Msmt 748 was considered ice affected and not used in shift distribution.

Special Computations.--	Discharge was estimated during periods of ice-affected record using adjacent good record before and after ice, water temperature data, hydrographer observations, air temperature trends from the Arkansas River near Wellsville gage, and upstream and downstream hydrographs to check estimated values. A hydrographic comparison was made with upstream seasonal gage: Arkansas River at Parkdale to check/validate daily average flows during peak runoff.
Remarks.--	Record is good for the entire water year, except for ice affected periods, which are estimated and are considered poor. The peak instantaneous flow is rated good-to-fair given the physical measurements made 14 days prior to and 6 days after the peak. Cableway inspected on May 23-24, 2011 and the report is filed with the Station Description. Station maintained and record developed by Charles DiDomenico.
Recommendations.--	An outside reference gage is recommended to validate stilling well levels. All chiseled benchmarks should be replaced with either a brass cap or concrete pin for improved accuracy during levels. The whitewater bypass section of the control should be surveyed during any low flow events (less than 200 cfs) to confirm the point of zero flow.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07096000 ARKANSAS RIVER AT CAÑON CITY

RATING TABLE-- ARKCANC023 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

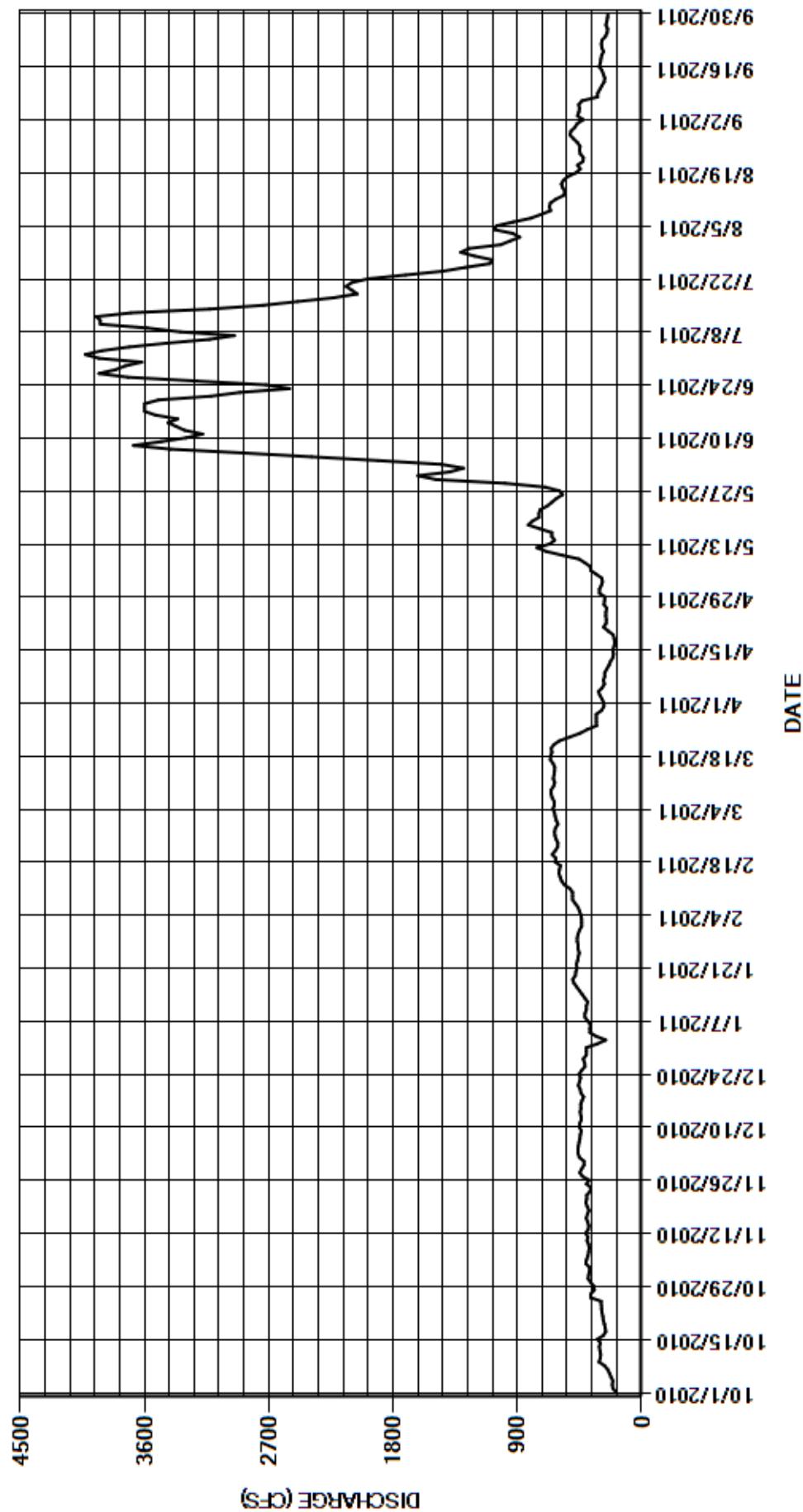
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	185	384	418	e320	e435	618	274	306	1390	3930	952	466
2	208	377	451	e260	e435	626	286	293	1290	4030	883	423
3	213	379	460	e330	e435	631	302	283	1450	3910	935	465
4	208	405	462	e375	e440	643	313	290	1910	3710	1070	455
5	222	399	458	e375	e450	632	286	329	2390	3440	1050	450
6	233	389	453	e370	e460	634	270	369	2880	3130	930	456
7	246	384	447	e390	e480	648	277	371	3410	2950	803	432
8	269	380	444	e410	e500	656	267	411	3680	3340	728	319
9	309	383	437	e410	e500	656	268	453	3480	3580	659	318
10	299	396	451	e400	e500	638	252	575	3300	3920	669	303
11	297	389	448	e400	e520	630	236	690	3180	3920	661	288
12	302	405	436	e390	e560	640	225	759	3310	3950	622	271
13	307	387	440	e410	e580	635	208	664	3370	3700	566	267
14	298	383	445	e430	e590	631	204	630	3430	3130	555	277
15	321	392	439	e450	599	629	210	652	3360	2740	571	287
16	277	401	442	e470	596	641	199	651	3520	2490	581	307
17	260	393	432	e490	587	661	195	738	3600	2230	567	299
18	264	382	420	e500	626	659	199	822	3600	2060	535	295
19	270	394	440	e480	621	650	207	792	3600	2100	475	290
20	278	404	445	477	648	655	242	743	3500	2140	444	276
21	281	398	458	468	625	636	276	744	3120	2100	464	288
22	287	399	450	473	608	596	258	735	2910	1980	425	292
23	291	374	443	464	606	520	256	684	2550	1710	422	287
24	292	367	453	459	619	446	260	650	2720	1440	445	262
25	292	400	434	452	628	394	259	617	3220	1280	450	250
26	370	381	410	460	631	326	253	573	3720	1100	446	247
27	367	429	413	459	624	328	273	595	3930	1080	466	259
28	343	448	423	466	606	329	269	700	3810	1210	494	252
29	347	434	401	466	---	329	266	989	3740	1310	520	247
30	369	417	e400	e460	---	291	306	1490	3620	1250	512	244
31	388	---	e400	e450	---	274	---	1620	---	1020	483	---
TOTAL	8893	11853	13553	13214	15509	17282	7596	20218	92990	79880	19383	9572
MEAN	287	395	437	426	554	557	253	652	3100	2577	625	319
AC-FT	17640	23510	26880	26210	30760	34280	15070	40100	184400	158400	38450	18990
MAX	388	448	462	500	648	661	313	1620	3930	4030	1070	466
MIN	185	367	400	260	435	274	195	283	1290	1020	422	244
CAL YR	2010	TOTAL	241086	MEAN	661	MAX	4990	MIN	161	AC-FT	478200	
WTR YR	2011	TOTAL	309943	MEAN	849	MAX	4030	MIN	185	AC-FT	614800	

MAX DISCH: 4110 CFS AT 11:45 ON JUL 02,2011 GH 9.00 FT SHIFT 0.25 FT

MAX GH: 9.00 FT AT 11:45 ON JUL 02,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07096000 ARKANSAS RIVER AT CAÑON CITY
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN

07097000 ARKANSAS RIVER AT PORTLAND

Water Year 2011

Location.--	Lat. 38°23'18", Long. 105°00'56", in NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 20, T.I9 S., R.68 W., Fremont County, Hydrologic Unit 11020002, on right bank at bridge on State Highway 120 at Portland and 1 mi downstream from Hardscrabble Creek.
Drainage Area and Period of Record.--	4,024 mi ² .
Equipment.--	Primary sensor is a Sutron Shaft Encoder and float inside a 36-inch CMP stilling well/shelter housed on the lower right bank terrace. The primary reference gage is drop tape referenced to an adjustable RP on the shelf inside the CMP well/shelter. A 4-ft x 4-ft steel shelter on the right bank upper terrace houses the Satlink 2 Data Collection Platform and a secondary CFB sensor. The upper shelter also accommodates a tipping bucket rain gage. The CFB monitors water level approximately 102 feet upstream of the stilling well intakes and its companion staff gage is set in the river adjacent to the CFB end cap. Water temperature and specific conductance is monitored by the USGS and logged – transmitted with the Satlink 2. A cable car is suspended from a monorail attached to upstream side of Highway 120 Bridge 10-15 feet downstream from gage. Equipment modifications for this water year include: Graphic water-stage recorder became non-operational in November 2010 and is no longer utilized. No other changes.
Hydrologic Conditions.--	The drainage basin which contributes to the gage encompasses approximately 3,950 square miles. Flow varies seasonally due mainly to snowmelt. Snowmelt generally runs from May through July and peak flows typically occur during this period. Flows can also be affected by thunderstorm runoff and flash flooding on upstream tributaries during the summer months. Otherwise, flows are highly affected by regulation of upstream reservoirs. Upstream operations from the Minnequa Canal also affect flows at the gage. No hydrologic conditions changes in the basin observed this water year. Channel bed consists of material from coarse sand to large cobble. The left bank above the gage is a steep (almost vertical bank) composed mostly of shale material and vegetation. The right bank consists of a more gradual slope to an elevation of 5 – 6 feet then a "shelf" going into another sloped side all of which is covered with vegetation. The river width is limited to approximately 120 feet by a railroad bridge with concrete abutments about 100 feet upstream of the gage and similarly limited by Highway 120 Bridge immediately below the gage.
Gage-Height Record.--	Primary record is 15-minute satellite-monitored shaft encoder data with DCP log and CFB backup. Record is complete and reliable except for the following ice affected gage height days: December 31, 2010, January 1-5, 11-13 and February 1-8, 2011. Missing unit values and/or suspect data were replaced with backup data with no loss of accuracy on the following dates: October 29, November 2, 2010 and March 13, 2011. Primary and backup stage sensor calibration to reference gage is supported by 25 visits made this water year.
Datum Corrections.--	Level surveys were completed five times at the gage site during WY2010 while trying out a rotary head laser level. An abbreviated level survey was run from BM#102 to the water surface at the CFB staff gage to recalibrate the staff gage and CFB after ice lifted the staff gage in February 2011.
Rating.--	The control at low flow is a downstream rock riffle that consists of gravel to large cobble in the stream channel. At medium to high flows, the riverbank, railway abutments and the highway bridge abutments are part of the control. Rating No.10 dated October 31, 2007 was used the entire water year. Rating No. 10 appears to be degrading over time as the average rating error has steadily increased over the four water years (1.8%, 10.1%, 9.9%, 17.6%). Twenty five discharge measurements (Nos. 990-1014) were made this water year ranging in discharge from 171 cfs to 3390 cfs. They cover the range in stage experienced except for the lower mean daily flows on April 17-19 and the higher mean daily flows of June 8, 17-19, 26-30 and July 1-4, 9-13. The peak flow of 3810 cfs occurred at 1715 on July 2, 2011 at a gage height of 5.88 ft with a shift of 0.21 ft. The peak exceeded the stage of high flow Measurement No. 1008 made June 17, 2011 by 0.38 feet.
Discharge.--	Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by time from the beginning of the water year through 1045 May 27, 2011 based on Measurements 990-1006; and again by time from 1200 August 11, 2011 to the end of the water year based on Measurements 1012-1014. A single stage-shift relationship was developed and used during the runoff/peak flow period. Shift curve ARKPORCOVS11 was used from 1100 May 27, 2011 through 1145 August 11, 2011. Measurements showed shifts varied from 0.04 ft to 0.36 ft. with all measurements made in open channel conditions. All measurements were given full weight and applied directly for record purposes with the exception of Nos. 1005, 1009, 1010 and 1012, which were discounted from -1.68% to +1.12% to smooth shift distributions.
Special Computations.--	An overlay of water temperature and gage height combined with site visits revealed several ice effect days this water year. The record is also affected by Minnequa Canal sluicing operations which occur upstream of the gage approximately 8.75 miles and at irregular intervals throughout the water year. This operation causes the gage height to increase then decrease rapidly over a short period of time before returning to pre-operation levels and is essentially smoothed in the record by the computation of the daily average of unit data. A hydrograph was used to compare the mean daily flows with upstream gage Arkansas River at Canon City. Minnequa Canal diversions were also examined for sluicing operations.
Remarks.--	The record is good, except periods of ice effect which are estimated and considered poor. The peak discharge is considered good. The State Highway Bridge that is part of the control at this gaging station is scheduled to be replaced in WY2012-13. At that time, the upstream staff gage and CFB will become the primary reference and sensor as the lower stilling well/shelter will be eradicated. Station maintained and record developed by Charles DiDomenico.

Recommendations.--

Since the ARKPORCO gaging station is the only inflow measurement for water administration in Pueblo Reservoir, recommend running the ARKPORCO gaging station simultaneously with a new gaging station located approximately 7-miles above Pueblo Reservoir during the bridge replacement project.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07097000 ARKANSAS RIVER AT PORTLAND

RATING TABLE-- ARKPORCO10 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

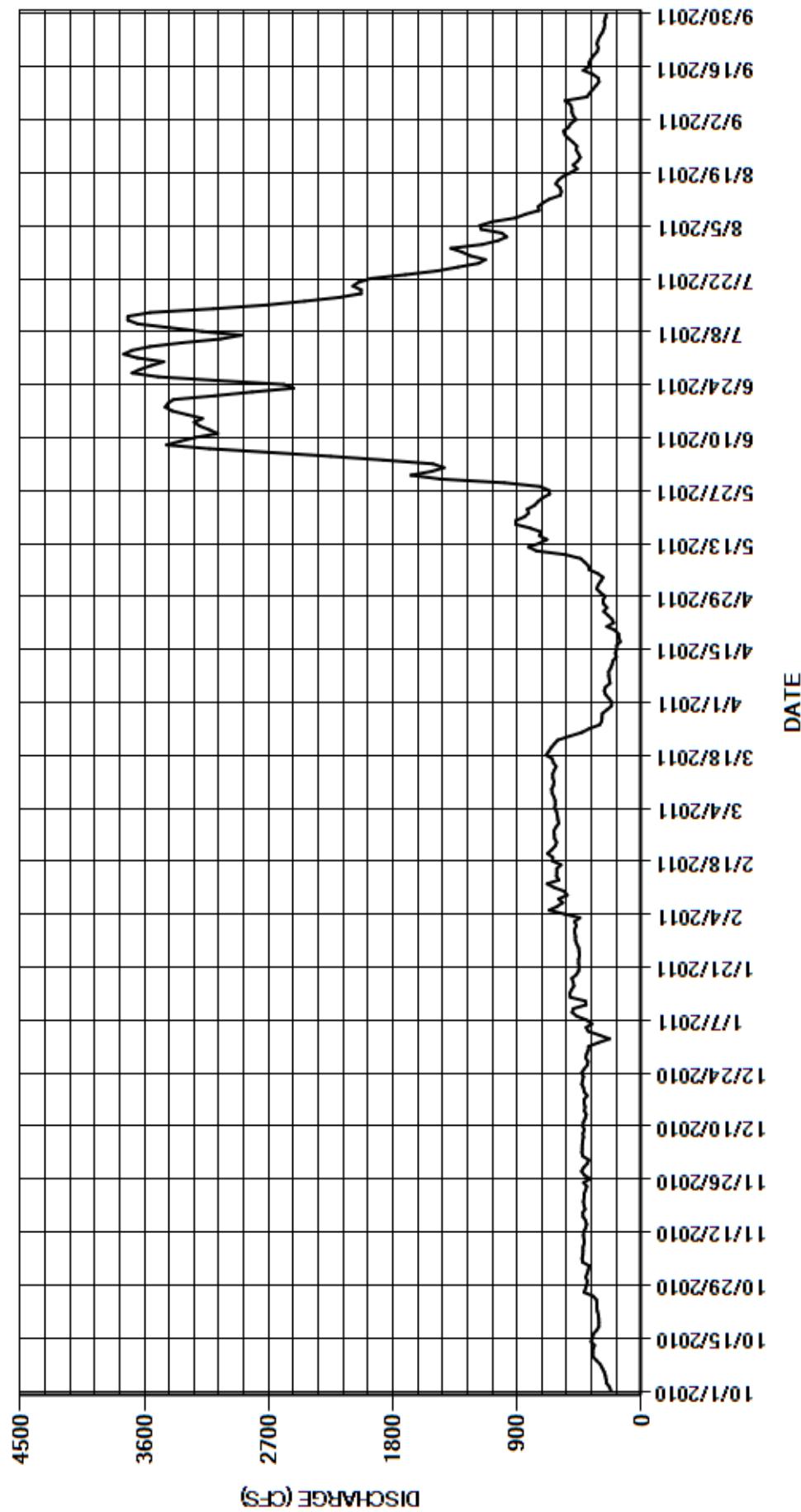
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	220	393	381	e312	e470	605	214	324	1520	3650	1040	511
2	232	385	424	e230	e485	609	235	313	1430	3750	976	474
3	252	378	431	e304	e445	614	259	294	1510	3690	1010	493
4	256	426	429	e385	e556	629	269	278	1870	3560	1160	504
5	261	429	428	e400	e668	624	260	315	2250	3330	1170	504
6	270	424	425	358	e610	625	227	377	2680	3050	1080	515
7	284	422	420	398	e570	634	232	384	3130	2900	912	553
8	298	422	423	468	e600	647	236	410	3440	3180	839	395
9	325	415	413	501	538	650	238	441	3340	3420	741	374
10	351	416	425	493	558	637	223	550	3230	3650	747	352
11	352	420	420	e401	630	633	212	761	3070	3720	714	328
12	350	418	407	e406	683	642	205	818	3130	3720	665	307
13	340	404	399	e515	597	643	181	739	3200	3560	587	313
14	364	397	413	519	615	631	189	685	3240	3100	580	353
15	354	405	407	506	613	617	179	739	3180	2710	590	421
16	348	422	415	489	613	638	179	726	3290	2440	620	381
17	323	425	414	494	582	645	153	804	3400	2190	602	381
18	307	408	393	504	643	689	162	910	3450	2030	567	365
19	307	416	414	470	642	671	165	910	3430	2030	511	345
20	309	420	419	454	680	653	190	847	3390	2090	465	319
21	311	415	431	451	649	630	250	817	3090	2050	494	312
22	319	415	426	455	624	606	201	826	2820	1960	463	322
23	324	405	420	455	614	520	214	775	2520	1710	443	314
24	321	395	432	448	629	432	243	750	2590	1480	456	301
25	325	419	416	451	631	379	273	717	3060	1330	472	283
26	349	371	393	454	633	303	249	665	3500	1180	467	272
27	415	414	387	467	618	287	274	670	3690	1130	495	266
28	405	433	404	477	599	285	278	732	3630	1240	527	268
29	396	418	397	477	---	283	263	993	3550	1300	555	259
30	392	393	385	482	---	249	298	1460	3460	1380	563	254
31	403	---	e382	482	---	217	---	1670	---	1150	527	---
TOTAL	10063	12323	12773	13706	16795	16927	6751	21700	89090	77680	21038	11039
MEAN	325	411	412	442	600	546	225	700	2970	2506	679	368
AC-FT	19960	24440	25340	27190	33310	33570	13390	43040	176700	154100	41730	21900
MAX	415	433	432	519	683	689	298	1670	3690	3750	1170	553
MIN	220	371	381	230	445	217	153	278	1430	1130	443	254
CAL YR	2010	TOTAL	250206	MEAN	685	MAX	5040	MIN	202	AC-FT	496300	
WTR YR	2011	TOTAL	309885	MEAN	849	MAX	3750	MIN	153	AC-FT	614700	

MAX DISCH: 3810 CFS AT 17:15 ON JUL 02,2011 GH 5.88 FT SHIFT 0.21 FT

MAX GH: 5.88 FT AT 17:15 ON JUL 02,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07097000 ARKANSAS RIVER AT PORTLAND
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
07099400 ARKANSAS RIVER ABOVE PUEBLO
Water Year 2011

Location.--	Lat. 38°16'18", Long. 104°43'03", in SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 36, T.20 S., R.66 W., Pueblo County, Hydrologic Unit 11020002, on left bank of Arkansas River, 100' downstream from NE corner of Arkansas River bridge, approx. 0.25 mi. downstream from Pueblo Dam, and 7 mi. West of Pueblo.
Drainage Area and Period of Record.--	4,670 mi ² . October 1965 to current year. Periodic water quality and sediment data available Oct. 1965 to current year.
Equipment.--	Satellite-monitored data collection platform (high data rate Sutron SatLink 2 DCP) with a Sutron Constant Flow Bubbler (CFB) and shaft encoder; and a Sutron Stage Discharge Recorder (SDR) in a 4 ft x 4 ft concrete block shelter over a CMP stilling well. The primary reference when the well has good contact to the river (gage heights greater than 1.80 ft) is an electric drop tape referenced to a fixed index mounted on the instrument shelf. A cableway located approximately 20 feet upstream from gage is used for high flow measurement. USGS Hydrolab measuring water temperature and specific conductance is co-located at the gage and monitored by the DCP. The SatLink 2 and the SDR were installed October 12, 2010. No other equipment changes made this water year.
Hydrologic Conditions.--	The gage is located approximately a quarter mile downstream of the Pueblo Reservoir Dam at an elevation of 4740 ft above MSL. Streamflow is directly affected at all stages by regulation of the reservoir gates. The riverbed mainly consists of gravel and cobble to large rocks 24+ inches. The channel is subject to moss growth of various types, varying from light accumulations to very dense at any time during the year, with increased growth from October - April due to the cold and low flows. The moss growth contributes to negative shifts as it tends to back up and slow down the flow of the water. Discharge measurements in the range from 650 to 800 cfs are of poor quality as the gage height is too deep to wade and too shallow for a good cable measurement. Measurements of less than 650 cfs are made from 50 to 450 feet below the gage depending on the gage height, while measurements over the 650 cfs are made from the cableway.
Gage-Height Record.--	Primary record is 15-minute satellite data. For the periods: October 1, 2010 to 1000 April 18, 2011 and from 1405 September 12 to September 30, 2011, when gage heights were less than 2.50 ft, the CFB was used for primary record. For the period: 1015 April 18 to 1400 September 21, 2011, when gage heights were over 2.50 ft, the shaft encoder was used for primary record, with stage discharge recorder used for backup purposes. The CFB is not used during high water, due to a problem with it tracking accurately at high stages. The record is complete and reliable for entire water year. This gage is immediately below the Pueblo Reservoir and does not experience ice effects.
Datum Corrections.--	Levels were not run this water year. Levels were last run August 16 and September 3, 2010. The ET index elevation was found to be within allowable limits, so no corrections were taken or necessary. Levels were run to the outside staff gage in Sept 2008. At that time, the staff was found to be 0.03 ft high, this has not been corrected.
Rating.--	The control at low flow is a series of rock riffles and large rocks, forming jetties below the gage. The large rocks (36 inch plus) were placed in clusters, starting at 100 feet below the gage house at various points crossing the river, while the "riffles" which start 150 feet below the gage house consist of 24 to 36 inch rock placed in a series of jetties extending from the left bank angling upstream at lengths from 30% to 50 % across the river. The control at medium and high flows is the riverbed (gravel to large cobble) along with the large rock placements and banks (grass and brush). Negative shifts continue to be observed at gage-heights less than 2.50 ft this water year due to moss growth in the channel. Moss growth was noted from October to mid May this water year. Rating No.18, implemented on November 17, 2008, was used this entire water year and is well defined to 7370 cfs. Rating 18 is defined by 73 historical measurements ranging from 32.8 cfs to 4920 cfs with 59% of these measurements showing positive shifts. Twenty-five discharge measurements (Nos. 1192 – 1216) were made this water year, ranging in discharge from 49.8 to 3460 cfs. They cover the range in stage experienced, except for the lower daily flows of February 12 - 14 and the higher daily flow of July 3, 2011. The peak discharge of 3600 cfs occurred at 0845 July 3, 2011 at a gage height of 6.37 ft with a shift of 0.11 ft. It exceeded Measurement No.1211 made July 3, 2011 by 0.17 ft in stage.
Discharge.--	Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and prorated by time for the periods: 0000 October 1, 2010 to 1430 April 11, 2011. Two variable shift curves were developed and applied to account for shift changes that occurred through the year as determined by numerous discharge measurements after many reservoir release gate changes. Variable shift curve SC11_11 (based on measurements Nos. 1202-1211) was applied from 1430 April 11 to 1200 July 11. Variable shift curve SC11_22 (based on measurements Nos. 1211 - 1217) was applied from 1215 July 11 to 1400 October 4. Measurements showed shifts varied from -0.12 to +0.11 ft., with all measurements made in open channel conditions. All measurements were given full weight with the exception of Nos. 1203, 1205, 1207, 1208, 1210 and 1214, which were discounted from -3 to +3 percent for smoothing purposes.
Special Computations.--	The downstream hydrograph at ARKMOFCO was compared to the final hydrograph for general validation of daily flows.
Remarks.--	The record is rated good, except for periods of moss, which should be considered fair. The peak gage-height and discharge are rated good due to the proximity of high water measurements on either side of the peak. Station maintained and record developed by Anthony D. Gutierrez.

Recommendations.--

A new outside gage covering the full range of stage expected should be installed. Re-evaluate Rating No 18 as the current average rating error is -3.81%.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07099400 ARKANSAS RIVER ABOVE PUEBLO

RATING TABLE-- ARKPUECO18 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

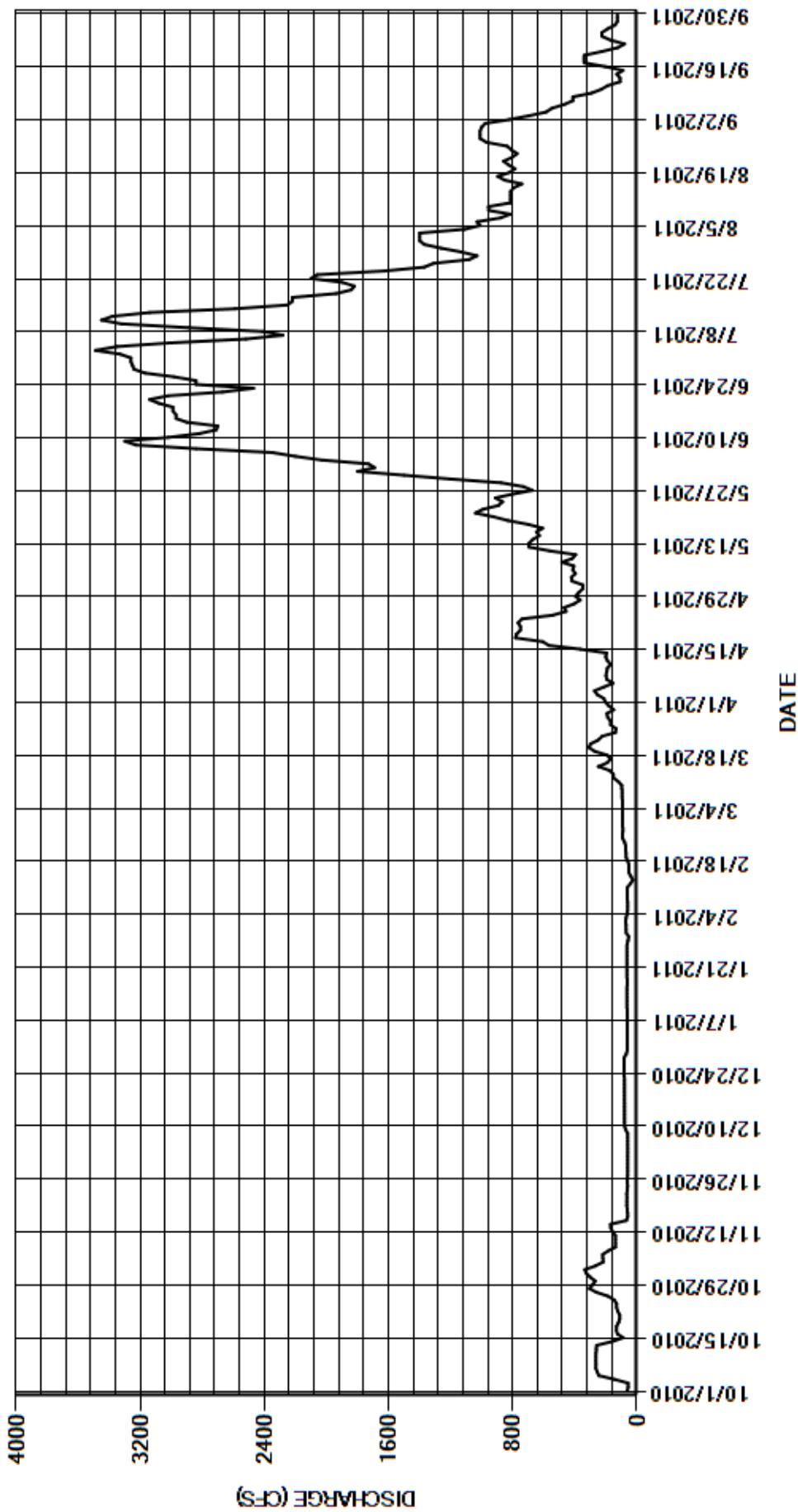
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	63	325	59	62	70	91	202	348	1800	3260	1400	977
2	55	335	59	62	71	91	213	348	1690	3330	1400	821
3	56	266	58	62	70	91	255	417	1730	3490	1400	697
4	144	217	58	62	62	92	273	422	2030	3350	1110	585
5	245	219	59	62	60	93	214	396	2200	3000	1010	547
6	255	220	59	62	60	93	153	413	2350	2520	1030	468
7	265	183	59	62	60	95	193	405	2840	2280	879	412
8	263	137	59	62	61	95	199	483	3230	2410	815	412
9	265	137	72	62	61	96	194	415	3300	2890	955	292
10	264	138	79	63	62	97	190	394	3020	3320	956	229
11	263	138	79	63	62	119	169	561	2820	3450	814	187
12	261	156	79	63	42	151	190	695	2710	3380	814	108
13	259	168	79	63	25	152	201	695	2700	3140	814	108
14	159	169	79	63	39	178	193	671	2900	2590	814	129
15	88	67	79	63	52	248	363	628	2970	2250	793	89
16	125	59	79	63	52	190	566	647	2970	2220	741	203
17	132	60	80	62	51	169	607	607	2990	2220	852	339
18	131	62	80	63	58	191	782	699	2990	1940	897	340
19	118	65	80	63	69	271	775	829	3080	1840	822	339
20	110	65	80	63	70	308	751	923	3140	1820	785	226
21	110	63	80	63	71	298	750	1040	3020	1900	825	124
22	123	65	80	63	71	249	765	991	2670	2100	859	79
23	130	62	81	63	79	223	741	892	2470	2060	805	168
24	130	60	82	63	91	138	541	865	2840	1620	771	224
25	146	61	82	63	93	134	456	912	2840	1370	808	225
26	186	61	82	63	90	169	469	801	2980	1310	836	188
27	260	60	82	63	91	169	404	673	3170	1080	969	140
28	305	59	82	57	91	188	365	732	3240	1030	1010	125
29	285	60	68	52	---	193	395	876	3250	1130	1010	126
30	268	59	62	68	---	149	374	1200	3260	1260	1010	125
31	300	---	62	69	---	180	---	1500	---	1370	1000	---
TOTAL	5764	3796	2258	1937	1834	5001	11943	21478	83200	70930	29004	9032
MEAN	186	127	72.8	62.5	65.5	161	398	693	2773	2288	936	301
AC-FT	11430	7530	4480	3840	3640	9920	23690	42600	165000	140700	57530	17910
MAX	305	335	82	69	93	308	782	1500	3300	3490	1400	977
MIN	55	59	58	52	25	91	153	348	1690	1030	741	79
CAL YR	2010	TOTAL	188860	MEAN	517	MAX	5080	MIN	55	AC-FT	374600	
WTR YR	2011	TOTAL	246177	MEAN	674	MAX	3490	MIN	25	AC-FT	488300	

MAX DISCH: 3600 CFS AT 08:45 ON JUL 03,2011 GH 6.37 FT SHIFT 0.11 FT

MAX GH: 6.37 FT AT 08:45 ON JUL 03,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07099400 ARKANSAS RIVER ABOVE PUEBLO
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
07111000 HUERFANO R AT MANZANARES XING, NR REDWING, CO
Water Year 2011

Location.--	Lat. 37°43'39.6", Long. 105°21'14", in sec 5, T.27 S., R.71 W., Huerfano County, on left bank 500 ft downstream from the Manzanares Crossing Bridge, 0.2 mi downstream from Manzanares Creek, and 4.1 mi southwest of Redwing, Colorado on Huerfano County Road 508 and 11.5 mi WSW of Gardner, Colorado.
Drainage Area and Period of Record.--	73 mi ² . Gage established July 1923 by USGS. History of gage prior to April 1946 published in USGS WSP's 1711 and 1731. From April 26, 1946 to September 30, 1972 gage was operated at datum 1.00 ft higher, with monthly discharge only for some periods of record. Gage discontinued from June 1972 through September 1977. Gage re-established October 6, 1977 at same location and datum. Gage record worked up intermittently through 1995. Record published by State Engineer's Office from 1995 to present.
Equipment.--	Sutron model 8210 High Data Rate (HDR) satellite-monitored data collection platform (DCP) with shaft encoder and graphic water-stage recorder, inside a 48-inch diameter corrugated metal pipe (CMP) shelter and stilling well. Shaft encoder and chart set to inside electric tape gage. A tipping bucket rain gage and temperature sensor are also recorded and transmitted by the DCP. A Bank Operated Cableway (BOC) was installed November 22, 2010 with the cable being installed May 17, 2011, for high water measurements up to 6.00 feet in gage height. No other changes this water year.
Hydrologic Conditions.--	The gage is set in a narrow reach of the Upper Huerfano Valley at an elevation of 8190 feet MSL. Above the gage is a combination of mountainous and high alpine terrain which is subject to flash flooding. Below the gage are several agricultural diversions, which are in a wide valley that extends to the eastern prairie of Colorado.
Gage-Height Record.--	The primary gage height record is 15-minute satellite data, with the DCP log and A-35 chart record used for back-up purposes. The record is complete and reliable, except for the following periods: October 25 - 29; November 2 - 5, 10 - 30; December 2 - 29, 2010; February 25 - 28; March 1 - 16, 22 - 24, 26, 29, 30; April 4, 5, 10 - 13, 15, 23, 24, 27, 28, 30; May 1 - 3, 2011, when the stage-discharge relationship was affected by ice in the river and/or well or ice on the control; December 1, 30, 31, 2010; January 1-31; February 1-24, 2011 when the well was frozen. Suspect gage-height data for February 22 due to the shaft encoder tape being off of the wheel was replaced with backup log data (source HURREDCO22) without loss of accuracy. Missing data on July 8, 2011 was replaced with backup log data (source HURREDCO03) without loss of accuracy.
Datum Corrections.--	No levels were run this water year. Levels were last run May 12, 2009.
Rating.--	A boulder/rock weir is the current control for stages up to about 3.6 ft (90 cfs). At higher stages the banks (left side is a concrete wing wall and right side covered with grass) become part of the control. Rating No. 25 was used the entire water year; it was developed from cross sections made May 20, 2009 along with a measurement of 93.6 cfs at gage-height of 3.65 ft. It is defined to a gage-height of 5.31 ft and discharge of 400 cfs, approximately four times the historic high measurement. Nineteen discharge measurements (Nos. 498 – 516) were made this water year, ranging in discharge from 9.26 to 26.8 cfs. They cover the range in stage experienced, except for the lower daily flows of December 4, 27 - 31, 2010; January 8 – 10, 15 – 18, 27; February 19 – 24, 26 - 28; March 22 – 31; April 30; May 1, 2; July 23 – 28; August 15 – 23, 26; September 29, 30, and the higher daily flows of May 19, 28 – 30; June 1 – 20; July 12; August 2 – 8; September 18, 2011. The peak discharge of 182 cfs occurred at 1800 August 28, 2011 at a gage height of 4.10 ft with a shift of +0.11 ft. It exceeded high Measurement No. 511 made June 22, 2011 by 1.09 feet in stage.
Discharge.--	Shifting control method was used the entire water year. Shifts were applied as defined by measurements and distributed by time from 0000 October 1, 2010 to the end of the water year. All measurements were made in open water and showed shifts ranging from -0.24 to +0.39 feet. All measurements were given full weight and shifts applied accordingly, except for Measurement Nos. 504 and 511 which were adjusted +6%, and +4% respectively for smoothing purposes. Control work on November 22, 2010 caused the shift to go from +0.39 to -0.23 feet, after which the ice formed in the river and well. After the ice period the shift was -0.17 feet. An event on May 28 appears to have caused movement in the weir and the gage height to drop which caused the shift to change from -0.23 to -0.02 feet. Shifts then came close to the rating by end of the water year.
Special Computations.--	The water year beginning shift was calculated using the measurement shift of 0.35 ft made September 29 to a shift change to 0.36 ft at 1245 October 2, and then prorated to the measurement made on October 22. Discharges for periods of ice effect were estimated based on eight discharge measurements (No. 499 – 506), temperature record, partial days of usable data and trends in flow. It should be noted that the measurements during the period of ice were all made in open water, with ice in the well either broken or cleared.
Remarks.--	Record good, except during periods of ice effect which are estimated and poor. The peak gage-height and discharge is considered fair due to problems with the weir washing out material and then deposition of new material. The shift before the peak was +0.11 (this was extended to the peak) and then prorated to +0.01 the day after with the weir filling in. After control work in November 22, 2010, negative shifts occurred after the ice period. At the end of May 2011 an event caused the shifts to come back in line with the rating. Station maintained and record developed by Anthony D. Gutierrez PS/ET II.
Recommendations.--	A new rating is needed due to shifting of the rock weir. Levels should be run in water year 2012, with a cross section of the weir.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07111000 HUERFANO R AT MANZANARES XING, NR REDWING, CO

RATING TABLE-- HURREDCO25 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

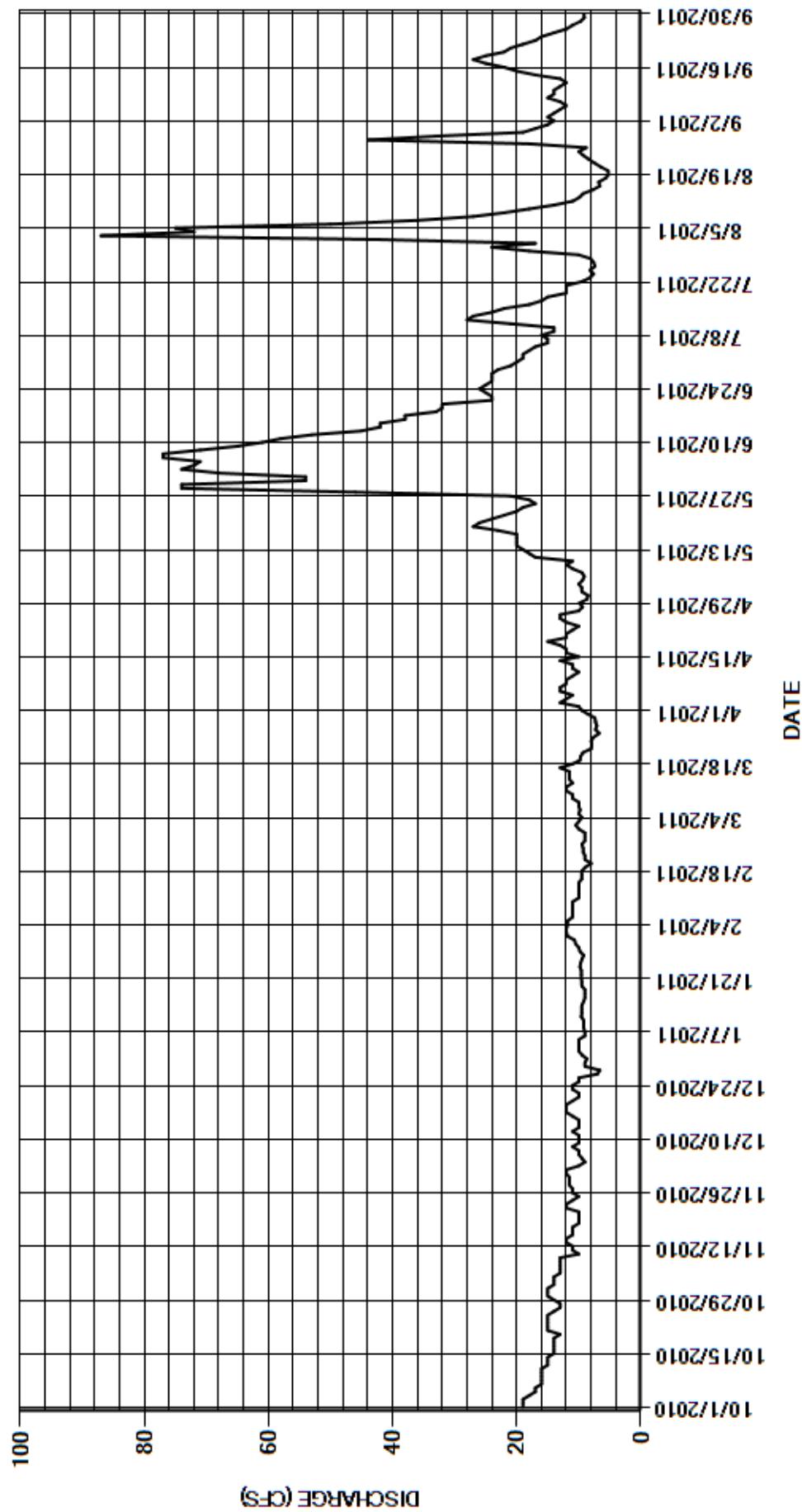
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	19	15	e12	e9.5	e12	e10	9.5	e8.5	54	20	17	15
2	19	e14	e12	e10	e12	e10	10	e9.5	68	19	42	14
3	19	e14	e10	e10	e12	e10	13	e9.5	74	19	87	15
4	18	e14	e9.0	e10	e12	e9.5	e12	10	72	18	72	14
5	17	e13	e9.5	e10	e12	e10	e11	9.4	71	17	75	13
6	17	13	e10	e9.0	e11	e9.8	13	9.1	77	15	50	12
7	16	13	e10	e9.0	e11	e10	13	9.5	77	15	36	13
8	16	13	e11	e9.2	e11	e10	12	11	71	16	27	15
9	16	13	e10	e9.2	e11	e11	12	12	65	14	22	14
10	16	e10	e10	e9.2	e11	e11	e11	11	61	14	18	14
11	16	e11	e10	e9.6	e10	e12	e10	17	58	21	14	13
12	15	e11	e11	e9.5	e10	e12	e11	18	53	28	11	12
13	15	e12	e10	e9.5	e10	e11	e11	19	45	27	9.9	13
14	15	e12	e10	e9.5	e10	e12	13	20	42	24	9.3	17
15	14	e11	e10	e9.2	e10	e12	e10	20	42	22	7.7	20
16	14	e11	e11	e9.0	e9.5	e12	12	20	38	18	6.6	22
17	14	e11	e12	e9.0	e9.5	13	12	20	38	16	6.8	25
18	14	e10	e12	e9.0	e9.5	11	13	23	33	15	5.7	27
19	14	e10	e12	e9.5	e9.0	9.8	15	27	32	12	5.2	25
20	13	e10	e11	e9.5	e8.0	9.7	12	26	32	12	5.3	22
21	15	e10	e10	e9.6	e9.0	9.3	12	24	24	12	6.5	21
22	15	e12	e10	e9.6	e9.0	e8.0	11	22	24	9.5	7.5	19
23	15	e12	e11	e9.6	e9.3	e7.9	e10	20	25	8.2	8.4	17
24	15	e11	e11	e9.8	e9.3	e8.0	e12	19	26	7.6	9.3	16
25	e15	e10	e10	e9.7	e9.5	7.6	13	17	25	8.2	10	14
26	e14	e11	e10	e9.5	e9.0	e6.7	13	18	24	7.4	8.8	12
27	e13	e11	e7.0	e9.2	e9.0	7.3	e10	21	24	7.6	18	11
28	e13	e12	e6.6	e9.8	e9.0	7.1	e9.4	46	24	8.1	44	9.7
29	e14	e12	e9.0	e10	---	e7.3	9.9	74	23	10	33	9.1
30	15	e12	e9.0	e10	---	e7.4	e8.7	74	21	18	19	9.2
31	15	---	e8.7	e11	---	8.5	---	54	---	24	17	---
TOTAL	476	354	314.8	296.2	283.6	300.9	344.5	698.5	1343	482.6	709.0	473.0
MEAN	15.4	11.8	10.2	9.55	10.1	9.71	11.5	22.5	44.8	15.6	22.9	15.8
AC-FT	944	702	624	588	563	597	683	1390	2660	957	1410	938
MAX	19	15	12	11	12	13	15	74	77	28	87	27
MIN	13	10	6.6	9.0	8.0	6.7	8.7	8.5	21	7.4	5.2	9.1
CAL YR	2010	TOTAL	9650.3	MEAN	26.4	MAX	145	MIN	5.0	AC-FT	19140	
WTR YR	2011	TOTAL	6076.1	MEAN	16.6	MAX	87	MIN	5.2	AC-FT	12050	

MAX DISCH: 182 CFS AT 18:00 ON AUG 28,2011 GH 4.10 FT SHIFT 0.11 FT

MAX GH: 4.10 FT AT 18:00 ON AUG 28,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

0711000 HUERFANO AT MANZANARES XING, NR REDWING, CO
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
07112500 HUERFANO RIVER AT BADITO
Water Year 2011

Location.--	Lat. 37°43'40.1", Long. 105°00'49.5" (Farisita, Colorado quadrangle, 1:24000 scale) in the SE¼ NE¼ SE¼ Sec.5, T27S, R68W, Huerfano County on left bank, 30 feet downstream of the crossing of CR 616 bridge over the Huerfano River, 13.1 mi west of the I-25 exit 56.
Drainage Area and Period of Record.--	532 sq mi. Apr 1, 1923 to Oct 31, 1925; Mar 1, 1938 to Sep 30, 1941; Oct 1, 1946 to Sep 30, 1954; Oct 1993 to Jun 1999; May 4, 2005 to present.
Equipment.--	Sutron Satlink-2 with high data rate (HDR) satellite-monitored data collection platform (DCP) attached to a Sutron Constant Flow Bubbler (CFB) in a 4 ft x 6 ft steel shelter. The primary gage is a concrete slope-gage immediately below the orifice. No changes this water year.
Hydrologic Conditions.--	The gage is located at a site across the river from the old Badito jail and settlement approximately 13.1 miles west of Interstate 25 on SR 69 elevation 6450 MSL with a drainage area of 532 mi ² as the river enters the Eastern Colorado prairie. There are several diversions above the gage, primarily for alfalfa irrigation. The river is subject to flash floods with numerous "feeder" streams contributing discharge above the gage.
Gage-Height Record.--	The primary record is 15-minute satellite-monitored continuous flow bubbler data with DCP and CFB log data used for backup. The record is complete. The record shows extreme gage height variability caused by debris and silt moving on and off the bubbler orifice and control and therefore reliability is of concern. The stage-discharge relationship was affected on the following dates by ice in the channel and/or ice on the control: October 28, 29, November 12-19, November 23-December 31, 2010; January 1-February 19, February 25 - 28, March 1-3, 5 - 10, 24, 25, 29, 30 April 3 - 6, 2011. Channel work upstream done as a result of the diversion dam failure in water year 2008 still affects the gage. This work which stripped the banks of vegetation provides for large amounts of material (mud and rock) and debris to wash downstream and deposit around the control.
Datum Corrections.--	No levels were run this water year. Levels were last run on September 3, 2008.
Rating.--	The primary control at all stages is the channel, along with thick bank vegetation on both banks downstream at higher stages. The bottom part of the concrete control structure of the gage is buried by mud and debris; this has formed a riffle control at lower flows. The channel immediately below the gage narrows and has thick growth with overhang on either side. Extreme flows with gage height over 9 feet will go into open field on both sides of the river 300+ feet across. Due to downstream channel fill and vegetation, shifts continued to the left of Rating 2A, producing an average rating error of -40%, indicating the need for a new rating. Rating 4, dated April 4, 2012, was developed and used for the entire water year. This rating is well defined to approximately 50 cfs with only a limited number of higher flow measurements. Nineteen discharge measurements (Nos. 136 – 154) were made this water year ranging in discharge from 4.31 to 17.6 cfs. They cover the range in stage experienced except for the lower daily flows of March 13 – 16, 19 –24, 26, 30, April 1, 2, 5, 6, August 6, 19, 20, and the higher daily flows of October 13 – 14, 19, 2010; February 20; May 29; June 15 – 21, 28 – 30; July 1 – 7, 28; Aug 3-29, 2011. The peak discharge of 255 cfs occurred at 1645 on July 28, 2011 at a gage height of 2.88 ft. with a shift of +0.02 ft. It exceeded the highest measured flow this water year (No. 148), made May 26, 2011, by 1.47 feet in stage.
Discharge.--	Shifting-control method was used for the entire water year. Shifts were applied as defined by measurements and distributed by time from the entire water year. Discharge measurements showed shifts ranging from -0.07 to +0.08 ft, with all measurements being made in open channel. Shifts were prorated by time due to the extreme variability in shifts at similar unit values. All measurements were given full weight, except for tandem measurements No. 142 and 150, which were discounted +6% and +9% to smooth shift distribution.
Special Computations.--	Discharge during periods of ice-effect was estimated based on measurements, temperature record from the Walsenburg weather station and partial day data. Hydrographs from HUEBADCO and upstream gage HURREDCO were used as a general comparison to validate events.
Remarks.--	The overall record and the peak are considered poor due to the extreme gage height variability caused by debris and silt moving on and off the bubbler orifice and control, ice effect, and lack of precision in the primary reference gage. Station maintained and record developed by Anthony D. Gutierrez PS/ET II
Recommendations.--	Determine and install a suitable alternative to the concrete slope gage used as a primary reference. Make more frequent measurements and gage visits to ensure debris is not caught on the bubbler orifice.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07112500 HUERFANO RIVER AT BADITO

RATING TABLE-- HUEBADCO04 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

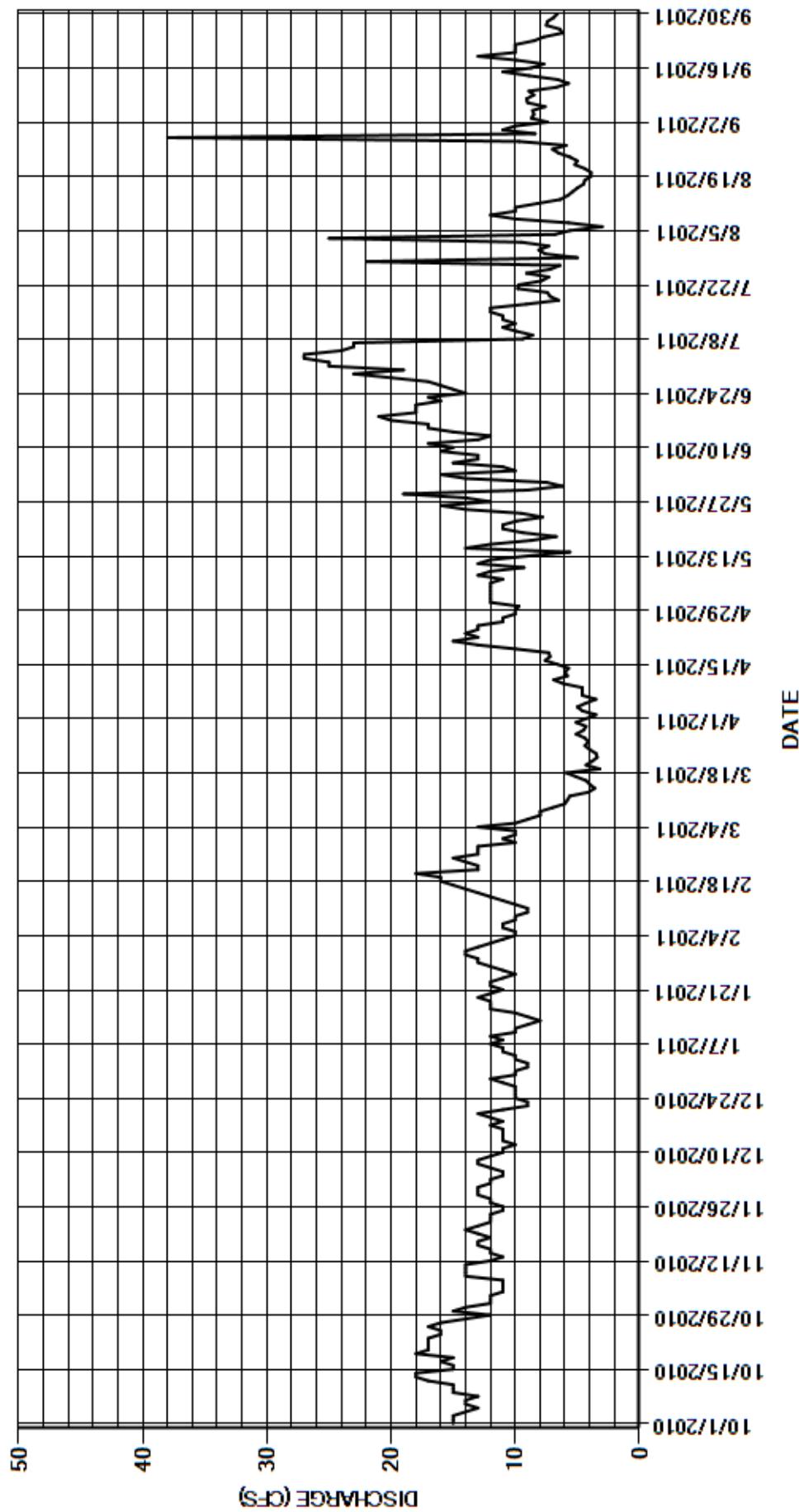
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	12	e13	e9.0	e13	e11	4.3	12	7.5	25	7.3	10
2	15	12	e12	e9.0	e12	e10	3.5	12	14	25	9.5	7.4
3	15	12	e12	e10	e11	e10	e4.6	12	16	27	25	8.7
4	14	11	e11	e10	e10	13	e5.0	12	10	27	6.8	8.5
5	13	11	e11	e11	e10	e10	e4.3	12	11	24	5.6	8.6
6	14	11	e12	e11	e11	e9.0	e3.5	12	15	23	3.0	7.6
7	14	11	e13	e12	e11	e8.0	4.6	11	13	23	5.7	9.0
8	13	14	e13	e11	e10	e8.0	4.6	13	13	9.4	10	9.1
9	15	14	e12	e12	e10	e7.0	4.6	12	16	8.6	12	8.5
10	15	14	e11	e10	e9.0	e6.0	6.1	9.3	15	9.9	10	8.9
11	15	14	e11	e10	e9.0	5.8	6.9	13	17	11	10	6.7
12	17	e12	e10	e9.0	e10	5.6	5.8	12	13	10	8.2	5.7
13	18	e11	e11	e8.0	e11	4.1	6.0	8.9	12	11	6.4	6.6
14	18	e12	e11	e9.0	e12	3.6	5.7	5.6	15	11	5.8	8.9
15	15	e12	e11	e10	e13	4.0	6.6	14	17	12	5.4	11
16	15	e13	e11	e12	e14	4.3	7.6	12	17	12	5.0	8.7
17	16	e13	e12	e12	e15	5.1	7.2	8.7	20	9.1	4.5	7.7
18	15	e12	e11	e12	e16	5.9	7.3	6.7	21	6.5	4.4	9.9
19	18	e13	e12	e13	e16	3.2	10	9.4	18	7.2	3.9	13
20	17	14	e13	e12	18	4.3	13	11	18	7.4	3.9	10
21	17	13	e11	e11	13	3.8	15	11	18	9.8	4.4	10
22	17	12	e9.0	e12	13	3.4	13	9.9	16	9.7	5.2	10
23	17	e12	e9.0	e12	14	3.5	14	7.8	17	7.9	5.0	8.5
24	16	e12	e10	e11	15	e4.0	13	9.5	14	7.3	5.6	7.7
25	16	e11	e10	e10	e13	e4.4	13	14	15	9.1	6.5	6.2
26	17	e11	e10	e11	e13	4.1	11	16	16	7.2	7.0	6.4
27	16	e12	e10	e12	e13	4.4	11	12	17	6.4	5.9	7.5
28	e14	e12	e11	e13	e10	5.1	10	14	20	22	9.7	7.4
29	e12	e13	e12	e13	---	e4.5	10	19	23	5.0	38	6.9
30	15	e13	e10	e14	---	e4.3	9.7	9.0	19	7.6	8.4	6.6
31	14	---	e10	e14	---	5.1	---	6.2	---	8.1	11	---
TOTAL	478	369	345.0	345.0	345.0	184.5	240.9	347.0	473.5	399.2	259.1	251.7
MEAN	15.4	12.3	11.1	11.1	12.3	5.95	8.03	11.2	15.8	12.9	8.36	8.39
AC-FT	948	732	684	684	684	366	478	688	939	792	514	499
MAX	18	14	13	14	18	13	15	19	23	27	38	13
MIN	12	11	9.0	8.0	9.0	3.2	3.5	5.6	7.5	5.0	3.0	5.7
CAL YR	2010	TOTAL	7819.1	MEAN	21.4	MAX	110	MIN	3.6	AC-FT	15510	
WTR YR	2011	TOTAL	4037.9	MEAN	11.1	MAX	38	MIN	3.0	AC-FT	8010	

MAX DISCH: 255 CFS AT 16:45 ON JUL 28,2011 GH 2.88 FT SHIFT 0.02 FT

MAX GH: 2.88 FT AT 16:45 ON JUL 28,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07112500 HUERFANO RIVER AT BADITO
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
07114000 CUCHARAS RIVER AT BOYD RANCH NEAR LA VETA
Water Year 2011

Location.--	Latitude 37° 25' 12", Longitude 105° 03' 08" (Cuchara, Colorado quadrangle, 1:24000 scale) in the SE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ Sec.24, T30S, R69W, Huerfano County on left bank at Boyd Ranch, 29 feet downstream from private bridge, 6.5 miles southwest of La Veta CO on Highway 12.
Drainage Area and Period of Record.--	56 mi ² . Established October 1, 1934 by the State Engineer's Office. Record has been intermittently published by the USGS and the State Engineer's Office. The Colorado State Engineer's Office published the record from water years 1979 to 1987 and again from 1995 to the current water year.
Equipment.--	Sutron model 8210 satellite-monitored data collection platform (DCP) with a High Data Rate (HDR) radio transmitter, with shaft encoder and graphic water-stage recorder in a 4 ft x 4 ft x 8 ft steel shelter over 48-inch corrugated pipe well. Shaft encoder and chart are set to the reference mark on the front of the equipment shelf using a drop-tape. A temperature sensor is also connected to the DCP. There is no outside staff gage. No changes this year.
Hydrologic Conditions.--	The gage is located in a gentle slope section of the Cucharas River Valley at an elevation of approximately 7,790 feet by topographic map. There are several diversions upstream of the gage for agriculture and the town of Cuchara. State Highway 12 is parallel to the right riverbank at an elevation of approximately 10 feet higher than pastureland adjacent to the left bank. Flooding would spill into the pasture on the left before flooding the highway. The gage is subject to freezing during the winter months.
Gage-Height Record.--	Primary record is 15-minute satellite data with DCP log and graphic chart record used for back-up purposes. Record is complete and reliable, except for the following periods: October 26 - 28; November 1, 2, 10 - 19, 22 - 30; December 1 - 9, 12 - 119, 24 - 31, 2010; January 1, 2; March 4, 11 - 14, 18, 23 - 25, 2011 when the stage-discharge relationship was affected by ice and January 3 - 31; February 1 - 28; March 1, 2, 5 - 10, 2011 when the well was frozen and the floats were trapped in the ice and the river was also ice covered, with ice on the control. Flush corrections were applied to the record, ranging from -0.02 ft to +0.03 ft. The new control continued to collect considerable amount silt in the weir pool. Positive shifts started at the beginning of May which is an indication of the weir beginning to leak. The peak and rain events on August 2 and 26, 2011 caused the material between the rocks forming the weir to "break loose" and wash out causing the weir to leak resulting in large positive shifts through the end of the water year.
Datum Corrections.--	No levels were run this year. Levels were last run April 24, 2009.
Rating.--	The control is a rock weir constructed in April 2009. It is rated for flows up to 350 cfs by cross section. Flows higher than 350 cfs are controlled by the brush-lined bank on the right side and the left bank, which was constructed using 4 – 8 inch cobble with large rocks lining the bottom of the bank. Rating No. 15 dated June 1, 2009 was used the entire water year. Rating 15 was developed as a result of the weir construction. Shifts for Rating 15 were mostly plotting slightly to the right before the wash out in August, after which the large shift to the right occurred. Rating 15 will continue to be used until the "leak" can be fixed. Twenty-one discharge measurements (Nos. 546 – 566) were made and ranged in discharge from 4.98 cfs to 28.3 cfs. They cover the range in stage experienced for the water year. The peak discharge of 30.7 cfs occurred at 0245 June 7, 2011 at a gage height of 2.05 ft with a shift of +0.02 ft. It exceeded Measurement 558 which was made on June 10 by 0.04 feet in stage.
Discharge.--	Shifting control method was used for all periods of good, ice-free record. Shifts were applied as defined by measurements and were distributed by time from 0000 October 1, 2010 to 1200 March 29, 2011. Two variable shift curves were developed and used: CRBRLVCO1101 from 1215 March 29 to 1200 June 10 and CRBRLVCOVSC11B from 1215 through the end of the WY to 1145 October 19, 2011. The low end of VSC11B reflects the large positive shifts as the weir leakage increased through the summer months, and is acknowledged to not follow the base rating 15 at the lower end. Measurements showed shifts varying from -0.05 to +0.58 ft. All open water measurements were given full weight, except Measurements 557, 559, 565, and 566 which were adjusted from -5% to +4% for smoothing purposes.
Special Computations.--	Discharges for periods of ice-affected record were estimated based on nine measurements (Nos. 547 – 555), air temperature data collected at the gage, and the hydrograph. The rain event of August 26 caused a shift change from +0.22 ft on August 25 to +0.58 ft on September 8. The difference of -0.16 ft in gage-height form before the rain to after the rain was applied to the shift of +0.22 ft, giving a new shift of +0.38 ft.
Remarks.--	The record is good, except during periods when the well was frozen and of ice effect which are estimated and considered poor. The period of August 2 - 11 continuing to August 25 should be considered fair due to the shift change after the rain on August 2. The period from August 26 to September 6 should be considered poor due to the "washing out" of the weir. This station maintained and record developed by Anthony D. Gutierrez PS/ET 2.
Recommendations.--	Levels need to be run in water year 2012. Repair of the leakage in the rock weir should be considered.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07114000 CUCHARAS RIVER AT BOYD RANCH NEAR LA VETA

RATING TABLE-- CRBRLVCO15 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

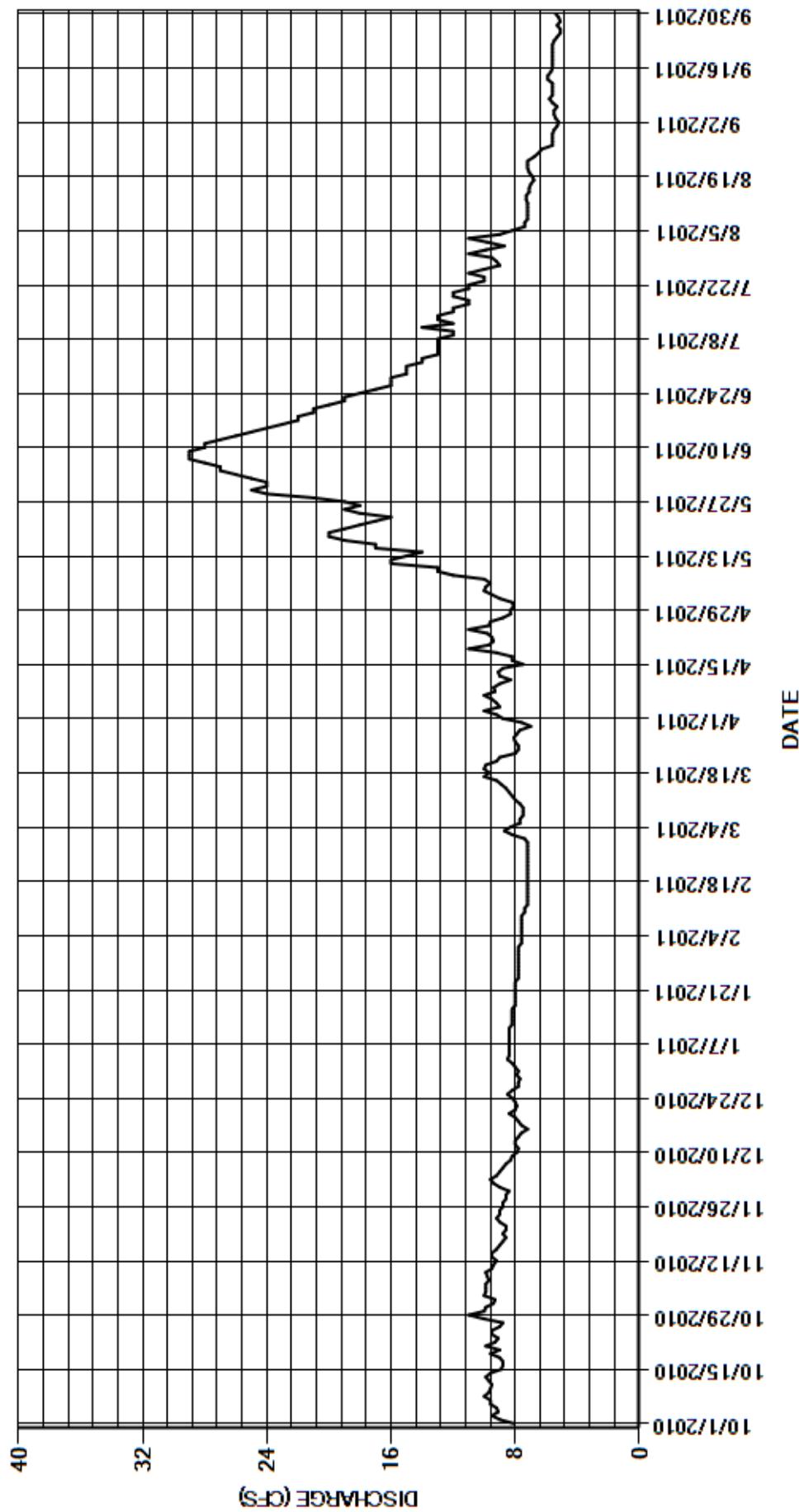
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.1	e9.4	e9.0	e8.0	e7.8	e7.4	8.8	8.2	24	15	8.7	5.3
2	9.0	e9.3	e9.4	e8.2	e7.6	e8.2	9.2	9.0	25	14	9.8	5.2
3	9.5	10	e9.6	e8.5	e7.6	8.7	10	9.5	26	14	11	5.4
4	9.1	9.9	e9.2	e8.4	e7.6	e8.3	9.0	10	27	13	9.0	5.5
5	9.2	9.9	e9.0	e8.4	e7.6	e7.7	9.2	9.9	27	13	8.2	5.5
6	9.6	9.9	e8.8	e8.4	e7.6	e7.7	9.5	9.6	28	13	7.4	5.3
7	9.6	9.7	e8.6	e8.4	e7.6	e7.5	10	10	29	13	7.4	5.6
8	10	9.8	e8.3	e8.4	e7.6	e7.5	9.3	12	29	13	7.2	5.8
9	9.7	9.9	e8.2	e8.4	e7.6	e7.5	9.4	13	29	12	7.2	5.6
10	9.6	e9.5	7.9	e8.4	e7.4	e7.7	9.0	13	28	12	7.2	5.6
11	9.5	e9.4	7.8	e8.4	e7.4	e8.0	8.3	16	28	14	7.2	5.6
12	9.7	e9.2	e8.0	e8.2	e7.2	e8.2	9.0	16	27	12	7.2	5.6
13	9.9	e9.5	e8.0	e8.2	e7.2	e8.4	9.1	15	26	13	7.3	5.9
14	9.6	e9.5	e7.8	e8.2	e7.2	e8.6	8.8	14	25	13	7.3	5.9
15	8.9	e9.2	e7.6	e8.2	e7.2	8.9	7.5	17	24	12	7.1	5.7
16	8.8	e9.0	e7.2	e8.2	e7.2	9.2	8.2	17	23	12	7.1	5.6
17	8.8	e8.8	e7.6	e8.0	e7.2	10	8.2	19	22	11	7.0	5.6
18	9.0	e8.6	e7.8	e8.0	e7.2	e9.7	9.2	20	22	11	6.8	5.6
19	9.6	8.8	e8.0	e8.0	e7.2	10	11	20	21	12	6.9	5.6
20	9.0	8.6	8.4	e8.0	e7.2	9.9	9.7	19	21	12	7.1	5.6
21	9.9	8.6	8.0	e8.0	e7.2	9.2	9.4	18	20	11	7.2	5.6
22	9.3	e9.0	7.9	e8.0	e7.2	9.0	9.5	17	19	11	7.2	5.6
23	9.1	e9.2	8.0	e8.0	e7.2	e8.0	9.8	16	19	10	7.2	5.5
24	9.5	e9.0	e8.2	e7.8	e7.2	e7.8	11	18	18	10	6.8	5.3
25	9.5	e9.0	e8.5	e7.8	e7.2	e7.8	9.7	19	17	11	6.5	5.1
26	e9.0	e8.8	e8.2	e7.8	e7.2	8.0	9.6	18	16	10	6.3	5.1
27	e8.8	e8.8	e7.8	e7.8	e7.2	8.1	8.8	19	16	9.0	5.6	5.3
28	e10	e8.6	e7.8	e7.8	e7.2	7.9	8.3	21	16	9.2	5.6	5.1
29	11	e8.6	e7.7	e7.8	---	7.7	8.3	24	15	9.5	5.6	5.2
30	10	e8.4	e7.9	e7.8	---	7.0	8.1	25	15	11	5.6	5.4
31	9.9	---	e7.8	e7.8	---	7.6	---	24	---	9.9	5.5	---
TOTAL	292.2	275.9	254.0	251.3	205.8	257.2	274.9	496.2	682	365.6	223.2	164.7
MEAN	9.43	9.20	8.19	8.11	7.35	8.30	9.16	16.0	22.7	11.8	7.20	5.49
AC-FT	580	547	504	498	408	510	545	984	1350	725	443	327
MAX	11	10	9.6	8.5	7.8	10	11	25	29	15	11	5.9
MIN	8.1	8.4	7.2	7.8	7.2	7.0	7.5	8.2	15	9.0	5.5	5.1
CAL YR	2010	TOTAL	9629.5	MEAN	26.4	MAX	124	MIN	4.0	AC-FT	19100	
WTR YR	2011	TOTAL	3743.0	MEAN	10.3	MAX	29	MIN	5.1	AC-FT	7420	

MAX DISCH: 30.7 CFS AT 02:45 ON JUN 07,2011 GH 2.05 FT SHIFT 0.02 FT

MAX GH: 2.05 FT AT 02:45 ON JUN 07,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07114000 CUCHARAS RIVER AT BOYD RANCH NEAR LA VETA
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
CUCHARAS RIVER AT HARRISON BRIDGE NEAR LA VETA, CO
Water Year 2011

Location.--	Lat. 37°33'02", Long. 104°56'11", in the NE $\frac{1}{4}$ SW $\frac{1}{4}$ Sec.6, T29S, R67W Huerfano County, on right bank at the Valley Road Harrison Bridge crossing of Cucharas River approximately 0.66 mile south of the intersection of Valley Road and Highway 160.
Drainage Area and Period of Record.--	196.16 sq.mi.
Equipment.--	Sutron model 8210 satellite-monitored data collection platform (DCP) and shaft encoder. The DCP is housed inside a 4 ft x 4 ft x 8 ft metal shelter at a higher elevation than the riverbank on the right side, while the shaft encoder is in a 20 in x 30 in metal "half" shelter atop an 18 inch diameter CMP stilling well attached to the downstream side of the center pier of Harrison Bridge. The shaft encoder is set using an electric tape inside of the well. On October 14, 2010 the 8210 DCP was replaced with a Sutron SatLink 2 DCP and a temperature sensor was also installed this date. No other changes this water year.
Hydrologic Conditions.--	The gage sits in a wide valley of the Cucharas River approximately 4.5 miles NNE of the town of La Veta. There are several tributaries as well as the urban runoff from La Veta which contribute to the flows. There are several irrigation diversions and a pipeline for the city of Walsenburg municipal water as well as the LaVeta Municipal Pipeline. Due to the where the gage sits east of La Veta Pass it is subject to flash flooding from rain storms in the summer and blizzard conditions in the winter.
Gage-Height Record.--	The primary record is 15-minute DCP log data with satellite data used for back-up purposes. Record is complete and reliable except for the following periods: October 26 - 29; November 10-18, 22 - 30, December 1 - 8, 11, 12, 16 - 19, 22 - 30, 2010; January 16 - 31; February 19 - 28; March 1, 2, 5 - 10; April 3 - 5, 2011, when the stage-discharge relationship was affected due to ice in the river and/or the well. Also, the periods: December 31, 2010; January 1-16; February 1 - 18, 2011, when the well was frozen. Missing periods of satellite data were filled in with DCP download data.
Datum Corrections.--	No levels were run this year. Levels were last run April 4, 2007 when the electric tape was set..
Rating.--	The control at low and medium flows up to 50 cfs is the shifting sand and gravel bed in the river channel. At medium to high stages the riverbanks and brush lining the edges of the channel as well as the center bridge pier, become part of the control. High flows of up to approximately 2000 cfs should be contained by the bridge. Extreme high flows can go out of channel to the flood plain north of the bridge, which is at a slightly lower elevation, and extends for approximately 200 feet to the north. Rating No. 2, dated Oct 1, 2003, was used the entire water year. Rating No. 2 was developed using measurement history and a theoretical rating extension based on channel survey work and is well-defined to about 500 cfs. Fifteen discharge measurements (Nos. 129 to 144) were made during water year. Measured discharges ranged from 2.56 cfs to 13.8 cfs, with five observations of no flow. They cover the range in stage experienced, except for the higher daily flow of June 9, 2011. The peak discharge of 22.1 cfs occurred at 1745 on April 1, 2011 at gage height of 2.06 ft with a shift of -0.03 ft. It exceeded high Measurement No. 139 made on June 10, 2011 by 0.09 feet in stage.
Discharge.--	Shifting control method was used for all periods of good, ice-free record. Shifts were applied as defined by measurements and were distributed by time for the entire water year. Open water measurements indicated shifts varying from -0.05 to 0.00 feet. All measurements were given full weight and applied directly. WY11 measurements were generally rated 'fair' to 'poor'. Measurements this water year have moved closer to the rating compared to Water Years 2009 and 2010, when measurements showed shifts farther to the left.
Special Computations.--	Discharge for periods of ice-affected record was estimated utilizing measurements, observations of ice, and temperature records from the NWS Walsenburg weather station, and partial days of usable record.
Remarks.--	Record is fair, except during periods of ice effect and no gage height, which are estimated and poor. Station maintained and record developed by Anthony Gutierrez .
Recommendations.--	Need to run levels.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

CUCHARAS RIVER AT HARRISON BRIDGE NEAR LA VETA, CO

RATING TABLE-- CRHBLVCO02 USED FROM 01-OCT-2010 TO 30-SEP-2011

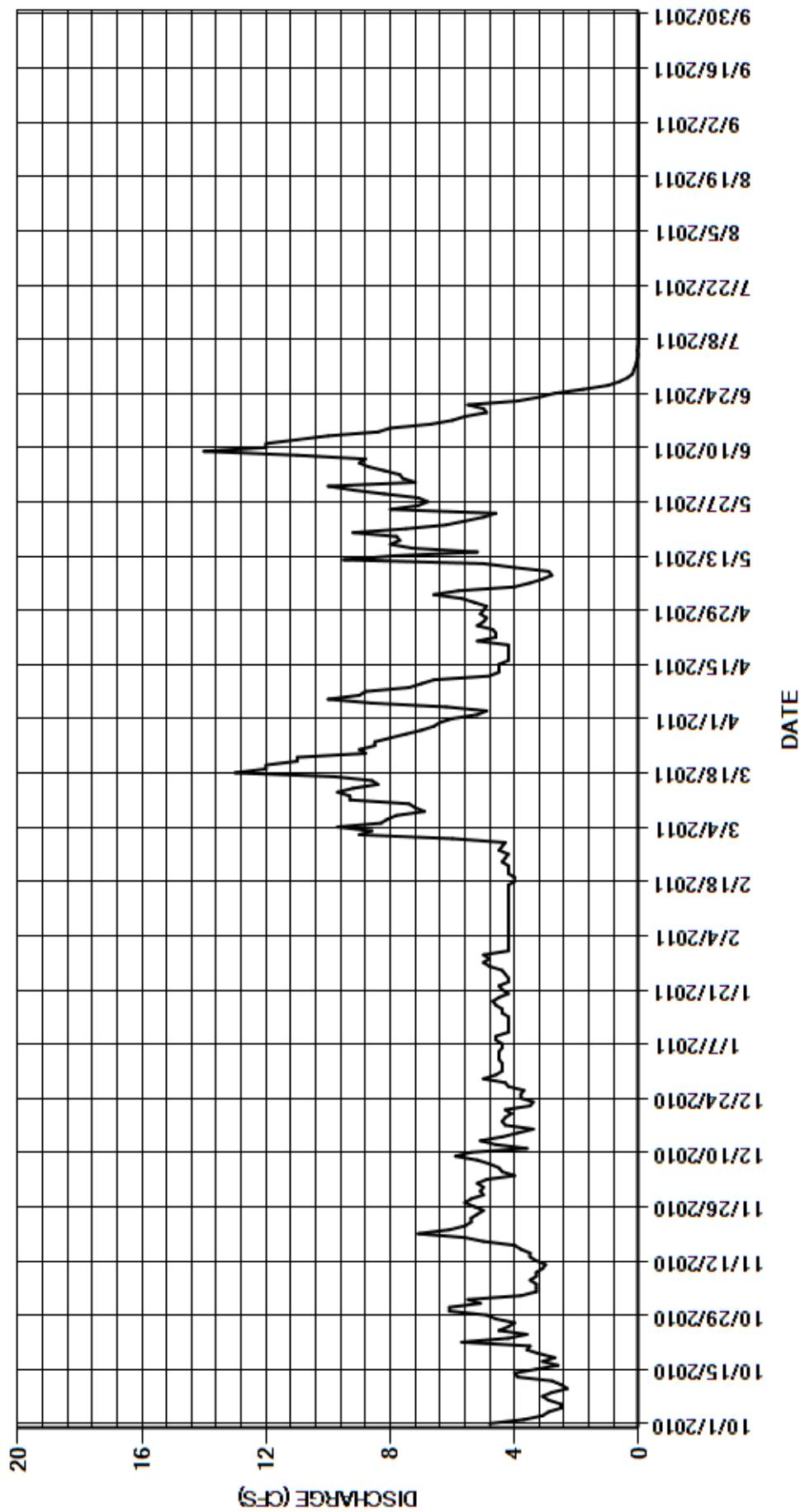
DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011												
DAY	MEAN VALUES											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.8	5.1	e5.0	e4.4	e4.2	e6.0	6.0	5.3	7.2	0.11	0.00	0.00
2	3.7	5.5	e5.2	e4.4	e4.2	9.0	5.2	5.7	7.6	0.07	0.00	0.00
3	3.1	3.8	e4.9	e4.5	e4.2	8.6	e4.9	6.6	7.7	0.04	0.00	0.00
4	2.9	3.3	e4.0	e4.5	e4.2	9.7	e6.2	5.8	8.2	0.02	0.00	0.00
5	2.5	3.3	e4.4	e4.5	e4.2	e8.3	e8.6	4.0	8.7	0.04	0.00	0.00
6	2.5	3.3	e4.5	e4.4	e4.2	e8.1	10	3.5	9.0	0.02	0.00	0.00
7	2.9	3.5	e4.8	e4.4	e4.2	e7.8	9.0	3.1	8.8	0.00	0.00	0.00
8	3.1	3.3	e5.2	e4.6	e4.2	e6.9	8.8	2.8	11	0.00	0.00	0.00
9	2.8	3.3	5.9	e4.6	e4.2	e7.2	7.4	2.9	14	0.00	0.00	0.00
10	2.3	e3.1	5.4	e4.2	e4.2	e7.4	7.0	4.0	12	0.00	0.00	0.00
11	2.5	e3.0	e3.6	e4.2	e4.2	9.3	6.6	5.0	12	0.00	0.00	0.00
12	2.8	e3.3	e4.6	e4.2	e4.2	9.3	4.8	9.5	11	0.00	0.00	0.00
13	3.9	e3.5	5.1	e4.2	e4.2	9.7	4.5	7.9	10	0.00	0.00	0.00
14	4.0	e3.5	4.4	e4.2	e4.2	9.2	4.5	5.2	8.4	0.00	0.00	0.00
15	3.3	e3.8	3.9	e4.4	e4.2	8.4	4.5	7.3	8.0	0.00	0.00	0.00
16	2.6	e4.0	e3.4	e4.4	e4.2	8.6	4.2	8.0	6.7	0.00	0.00	0.00
17	3.1	e5.0	e4.3	e4.6	e4.2	9.8	4.2	7.7	6.0	0.00	0.00	0.00
18	2.7	e5.6	e4.4	e4.7	e4.0	13	4.2	7.8	5.6	0.00	0.00	0.00
19	3.2	7.1	e4.3	e4.5	e4.0	12	4.2	9.2	4.9	0.00	0.00	0.00
20	3.6	6.1	e4.1	e4.2	e4.2	12	4.2	7.5	5.0	0.00	0.00	0.00
21	3.5	5.6	4.3	e4.4	e4.2	11	5.2	6.2	5.5	0.00	0.00	0.00
22	5.7	e5.4	e3.5	e4.5	e4.2	11	4.6	5.6	3.9	0.00	0.00	0.00
23	4.2	e5.4	e3.4	e4.2	e4.4	8.8	4.6	5.0	3.2	0.00	0.00	0.00
24	3.6	e5.2	e3.8	e4.2	e4.3	9.0	4.7	4.6	2.7	0.00	0.00	0.00
25	4.5	e5.0	e3.8	e4.3	e4.2	8.5	5.2	8.0	1.8	0.00	0.00	0.00
26	e4.2	e5.3	e3.7	e4.4	e4.5	8.5	5.0	7.1	1.0	0.00	0.00	0.00
27	e4.0	e5.6	e4.2	e4.8	e4.4	8.0	4.9	6.8	0.62	0.00	0.00	0.00
28	e4.6	e5.4	e4.3	e5.0	e4.3	7.5	5.1	7.1	0.36	0.00	0.00	0.00
29	e4.9	e5.0	e5.0	e4.8	---	7.0	5.0	8.2	0.20	0.00	0.00	0.00
30	6.1	e5.1	e4.6	e5.0	---	6.6	4.9	9.2	0.16	0.00	0.00	0.00
31	6.1	---	e4.4	e4.2	---	6.4	---	10	---	0.00	0.00	---
TOTAL	113.7	135.4	136.4	137.9	118.1	272.6	168.2	196.6	191.24	0.30	0.00	0.00
MEAN	3.67	4.51	4.40	4.45	4.22	8.79	5.61	6.34	6.37	0.010	0.000	0.000
AC-FT	226	269	271	274	234	541	334	390	379	0.6	0	0
MAX	6.1	7.1	5.9	5.0	4.5	13	10	10	14	0.11	0.00	0.00
MIN	2.3	3.0	3.4	4.2	4.0	6.0	4.2	2.8	0.16	0.00	0.00	0.00
CAL YR	2010	TOTAL	12843.30	MEAN	35.2	MAX	196	MIN	1.1	AC-FT	25470	
WTR YR	2011	TOTAL	1470.44	MEAN	4.03	MAX	14	MIN	0.00	AC-FT	2920	

MAX DISCH: 22.1 CFS AT 17:45 ON APR 01,2011 GH 2.06 FT SHIFT -0.03 FT

MAX GH: 2.06 FT AT 17:45 ON APR 01,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CUCHARAS RIVER AT HARRISON BRIDGE NEAR LAVETA, CO
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
OXFORD FARMERS DITCH COMPANY
Water Year 2011

Location.--	Lat. 38°10'34", Long. 104°08'42", in the NE $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ Sec.32, T21S, R60W Pueblo County, Hydrologic Unit 11020005, approximately 0.33 mi upstream from Arkansas River at Nepesta Rd. Bridge river gage.
Drainage Area and Period of Record.--	N/A.
Equipment.--	Sutron SatLink DCP/logger with High Data Rate radio and shaft encoder in a stilling well inside a wood frame shelter at a twelve-foot standard concrete Parshall flume. A float-activated A-35 graphic water-stage recorder is also in the stilling well. Primary reference gage is outside staff gage installed in flume. No changes this water year.
Hydrologic Conditions.--	The Oxford Farmers ditch diverts water from the Arkansas River upstream from the Nepesta gage approximately 0.40 miles. The ditch company owns a variety of direct flow water rights and receives Winter Water and Fry-Ark Project water from Pueblo Reservoir. Pueblo Reservoir regulates flows throughout the water year and is located approximately 43 miles upstream from the gage with a travel time of approximately 18 hours. Non-regulated inflows to the Arkansas River below Pueblo Reservoir and above the gage include Fountain Creek, St. Charles River and the Huerfano River. The influence of urbanization provides the largest affect to the runoff regime. No hydrologic condition changes this water year
Gage-Height Record.--	Primary record is 15-minute satellite-monitored data with DCP log data and the graphic chart recorder used for backup purposes. Record is complete and reliable for this seasonally operated gage. For the period from November 15 to March 15, there is no flow in the ditch as the company participates in the Winter Water Storage Program in Pueblo Reservoir. From March 15 to November 15, the well is open and the shaft encoder was working properly.
Datum Corrections.--	No levels were run to the flume this water year.
Rating.--	The control is a standard, 12-foot, concrete Parshall Flume. A standard 12-ft Parshall Flume table was used all year. One discharge measurement was made this year. Measurements Numbers 14 and 15 (October 7, 2010 and October 4, 2011) were utilized to distribute shifts. Both measurements discounted the raw shifts back to 0.00 ft. The peak flow of 142 cfs occurred at 0945 on June 8, 2011 at a gage height of 2.00 feet with a shift of 0.00 ft.
Discharge.--	Shifting control method was used for the entire water year. A zero shift based on measurements from water years 2010 and 2011 was applied to the entire WY2011 period of record. The well and flume were cleaned four times between April and September. A shift of 0.00 was used for the irrigation year.
Special Computations.--	During periods of flume cleaning, gage height data was adjusted through the use of datum corrections which yielded zero flow.
Remarks.--	Record is considered fair due to the sand and moss buildup that occurs in the flume during the irrigation season, which would introduce uncertainty into the actual shift that should be applied afterwards, and also due to the poor precision of the gage heights (chatter) measured in the stilling well. The Arkansas River near Nepesta CO gaging station was moved from above the Oxford Farmers Ditch diversion to the Nepesta Road Bridge below the Oxford diversion beginning October 1, 2000. For consistency and comparison with previously published historical record in this reach of the Arkansas River, the Oxford Ditch mean daily discharge is combined with the mean daily discharge measured at Arkansas River at Nepesta Road Bridge near Nepesta CO gaging station. Station maintained and record developed by Steven Ray Anselmo.
Recommendations.--	A complete flume inspection should be performed during the non irrigation season to confirm the floor elevations, the position of the staff gage and the overall flume geometry. The measurement bridge should be positioned at the outside staff gage. The flume should be measured every water year.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

OXFORD FARMERS DITCH COMPANY

RATING TABLE.-- STD12FTP USED FROM 01-OCT-2010 TO 30-SEP-2011

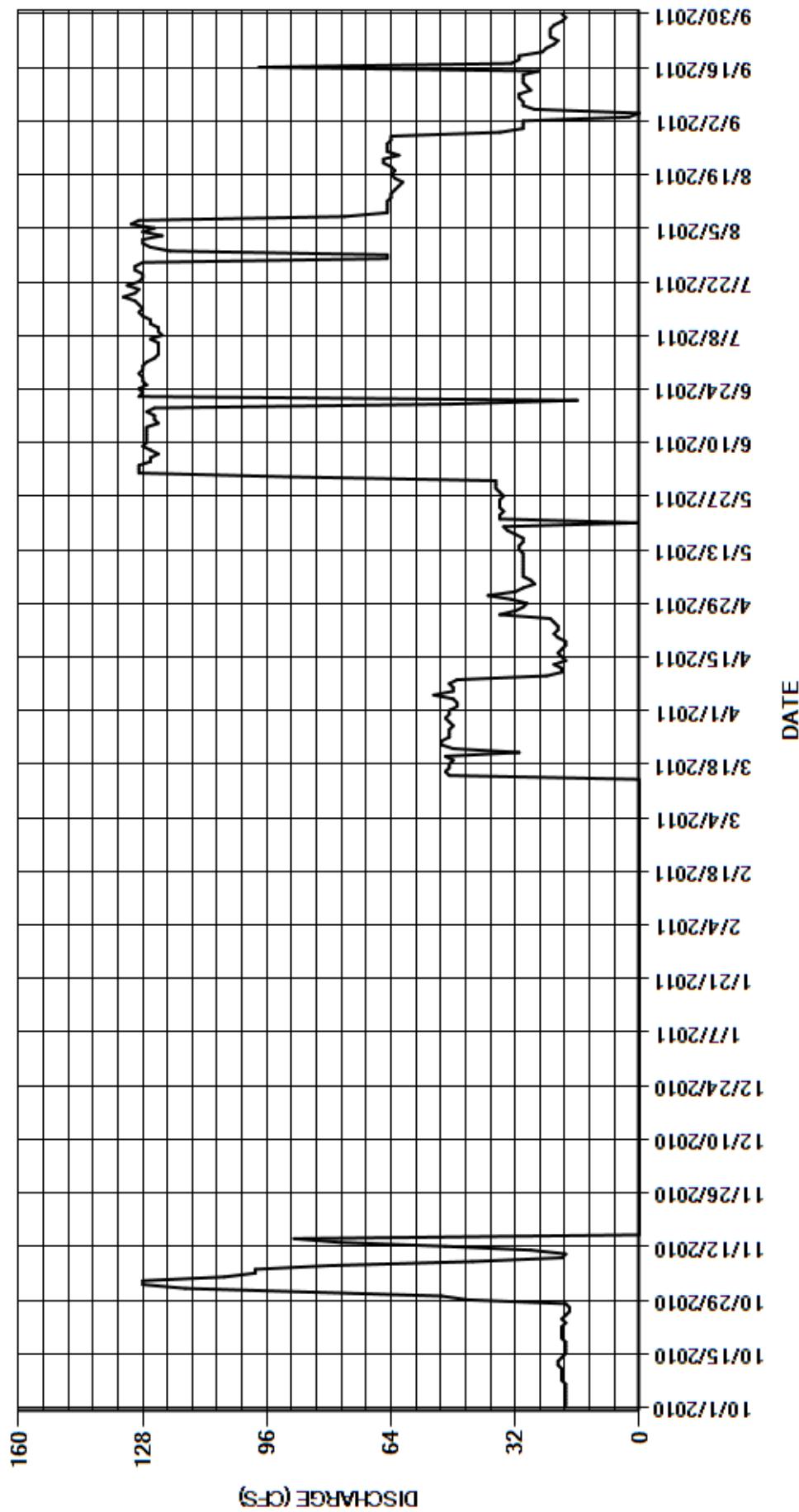
DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011												
DAY	MEAN VALUES											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	19	117	0.00	0.00	0.00	0.00	49	39	90	127	128	30
2	19	128	0.00	0.00	0.00	0.00	47	32	129	125	128	30
3	19	128	0.00	0.00	0.00	0.00	47	30	129	124	123	2.7
4	19	107	0.00	0.00	0.00	0.00	48	27	129	124	128	0.00
5	19	99	0.00	0.00	0.00	0.00	53	28	126	124	125	27
6	19	99	0.00	0.00	0.00	0.00	48	30	126	124	131	30
7	19	79	0.00	0.00	0.00	0.00	48	30	124	126	129	30
8	20	43	0.00	0.00	0.00	0.00	49	30	126	123	76	31
9	20	20	0.00	0.00	0.00	0.00	47	30	128	124	65	31
10	20	19	0.00	0.00	0.00	0.00	24	30	127	124	65	28
11	20	28	0.00	0.00	0.00	0.00	20	30	127	126	65	29
12	21	50	0.00	0.00	0.00	0.00	20	30	127	126	65	30
13	21	77	0.00	0.00	0.00	0.00	22	31	127	128	64	30
14	20	89	0.00	0.00	0.00	0.12	19	31	127	129	64	30
15	19	0.00	0.00	0.00	0.00	49	20	30	124	128	63	26
16	19	0.00	0.00	0.00	0.00	50	21	30	125	129	62	98
17	19	0.00	0.00	0.00	0.00	49	20	32	125	130	61	33
18	19	0.00	0.00	0.00	0.00	49	19	34	127	133	63	31
19	20	0.00	0.00	0.00	0.00	48	19	35	125	130	64	31
20	20	0.00	0.00	0.00	0.00	50	21	0.37	49	129	63	25
21	20	0.00	0.00	0.00	0.00	31	22	36	16	132	64	24
22	20	0.00	0.00	0.00	0.00	48	21	36	129	129	66	22
23	19	0.00	0.00	0.00	0.00	51	21	35	128	128	66	21
24	20	0.00	0.00	0.00	0.00	51	22	36	129	128	62	23
25	19	0.00	0.00	0.00	0.00	49	23	36	127	130	65	23
26	18	0.00	0.00	0.00	0.00	49	36	36	128	130	65	23
27	18	0.00	0.00	0.00	0.00	49	32	35	128	128	65	22
28	19	0.00	0.00	0.00	0.00	48	30	36	129	65	64	20
29	44	0.00	0.00	0.00	---	49	29	37	128	65	64	19
30	51	0.00	0.00	0.00	---	50	33	37	128	121	36	20
31	84	---	0.00	0.00	---	49	---	37	---	126	30	---
TOTAL	723	1083.00	0.00	0.00	0.00	819.12	930	986.37	3587	3815	2379	819.70
MEAN	23.3	36.1	0.000	0.000	0.000	26.4	31.0	31.8	120	123	76.7	27.3
AC-FT	1430	2150	0	0	0	1620	1840	1960	7110	7570	4720	1630
MAX	84	128	0.00	0.00	0.00	51	53	39	129	133	131	98
MIN	18	0.00	0.00	0.00	0.00	0.00	19	0.37	16	65	30	0.00
CAL YR	2010	TOTAL	16517.20	MEAN	45.3	MAX	128	MIN	0.00	AC-FT	32760	
WTR YR	2011	TOTAL	15142.19	MEAN	41.5	MAX	133	MIN	0.00	AC-FT	30030	

MAX DISCH: 142 CFS AT 09:45 ON JUN 08,2011 GH 2.00 FT SHIFT 0 FT

MAX GH: 2.00 FT AT 09:45 ON JUN 08,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

OXFORD FARMERS DITCH COMPANY
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
07117000 ARKANSAS RIVER AT NEPESTA BRIDGE NEAR NEPESTA, CO
Water Year 2011

Location.--	Lat. 38°10'44", Long. 104°08'20", in the NE¼ SE¼ NW¼ Sec.32, T21S, R60W Pueblo County, Hydrologic Unit 11020005, on the left bank downstream side of the Nepesta Road Bridge crossing the Arkansas River, 0.8 mi downstream of Kramer Creek, 9 mi downstream from Huerfano River, 1 mile NNW of the Nepesta Cemetery.
Drainage Area and Period of Record.--	9,345 mi ² of which 54 sq.mi. is probably noncontributing (furnished by the U.S Army Corp of Engineers). Established May 1, 1901. Intermittent record until June 1921 at various sites and datums above the current site. From June 1921 to September 30, 2000 at various sites within 2 miles of the present site. At present site October 1, 2000 through current water year.
Equipment.--	Replaced the Sutron 8210 High Data Rate satellite-monitored data collection platform with data logger and Sutron Accubar with constant nitrogen bubbling using a site feed assembly with a Sutron SatLink2 (DCP) and continuous flow bubbler (CFB) on October 14, 2010. Equipment housed in a 4 ft x 4 ft steel shelter. The primary reference gage is a wire weight located in the same river section as the end of the orifice line with muffler and attached to the bridge approximately 120 ft south of the gage shelter. A temperature sensor is also monitored and logged by the DCP. An SDI-12 Radar Water Level Sensor from Design Analysis Associates was installed in May of 2011 and is used for comparison and back-up data to the CFB.
Hydrologic Conditions.--	The gage is located at the Pueblo County Road 613 bridge over the Arkansas River on a fairly straight stretch of river that extends from 800 feet upstream to a half mile downstream of the gage. The gage elevation is 4380 ft MSL. The riverbed consists of moving sand at all stages. Upstream sluice outlets from the Colorado Canal, Rocky Ford Highline Canal and Oxford Farmers Ditch as well as Fountain Creek contribute a supply of loose sand, especially during the irrigation season and high water. The channel width is 280 feet at the gage and widens considerably above and below the gage. The contributing drainage area is 9,345 square miles (furnished by the Army Corp of Engineers). The upper basin consists of mountain topography above Pueblo Reservoir. The lower basin consists of several unregulated tributaries below Pueblo (Fountain Creek, Salt Creek, the St. Charles River, Six Mile Creek, and the Huerfano River), large agricultural areas, and urban runoff from Pueblo and portions of the Colorado Springs area.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and radar gage as backup. Record is complete and reliable, except for the periods December 31, 2010; January 1 – 17, 31; February 1 – 14, 2011 when ice at or near the gage appears to have affected the stage-discharge relationship.
Datum Corrections.--	Levels were last run May 4, 2009 to the wire weight check-bar using RM No. 1 as bench mark and no corrections were needed.
Rating.--	The primary control at all stages is a shifting sand channel. At the gage, the channel is contained by the county road bridge and the railroad bridge. Flows of up to approximately 5000 cfs are contained in a well-defined channel under the bridge. At higher flows, large riprap, which continues up to the bottom of the bridge, and heavy vegetation on both banks below the bridge, become part of the control. Backwater flow is negated by the elevation of the road and a large fan area below the gage. The rating is well defined to 25,000 cfs by a high water mark on the bridge piers made during May 1999 flood and an indirect rating extension performed by the USGS. Discharge measurements of up to 1500 cfs can be made approximately 400 – 500 feet downstream of the bridge, with higher flows measured from the bridge. Extremely low discharge measurements (less than 50 cfs) are made as much as a quarter of a mile upstream, near the Oxford Farmers Ditch flume. Rating No. 16 was used the entire water year. This rating was developed as the result of large negative shifts in previous years. This rating incorporated both high flow (USGS indirect measurement) and extreme low flows (due to drought conditions). Estimated PZF is 10.42 ft. Twenty four discharge measurements (Nos. 220 – 243) were made this water year ranging in discharge from 45.4 cfs to 3480 cfs. All measurements were made in open water by either wading or bridge crane. The measurements cover the range in stage typically observed except for the lower daily flows of January 28-31 and February 1, 2011. The peak discharge of 3920 cfs occurred at 1200 September 16, 2011 at a gage height of 15.04 ft with a shift of -0.04 ft. It exceeded the gage height of the maximum measured discharge by 0.22 ft. The maximum measured discharge and the peak occurred on the same day.
Discharge.--	Shifting-control method was used for the entire water year. Shifts were applied as defined by measurements and distributed by time from October 1, 2010 to May 2, 2011. At this point, two variable shift curves were employed to the end of the water year which defined the ascending limb of the peak hydrograph (ARKNEPCOSC72B, 5/2/2011 – 9/16/2011, Measurement Nos. 230-242) and the descending limb of the hydrograph (ARKNEPCO72C, 9/16/2011-10/4/2011, Measurement Nos.242-244). Overall discharge measurements showed shifts ranging from -0.82 ft to -0.04 ft. All measurements were given full weight with the exception of Measurements 230-239 ,which were discounted +4.93% to -5.18% for variable shift curve smoothing purposes.
Special Computations.--	The shift change on January 27, 2011(starting at -0.24 ft to -0.82 ft) is a result of ice moving through the channel leaving behind a large amount of sand during the ice period. Hydrographs of the upstream gages; Arkansas River at Avondale, Rocky Ford Highline Canal, and Oxford Farmers Ditch were reviewed to help with estimating and verifying discharge values. Discharge Measurement No. 242 nearly captured the instantaneous high peak on September 16, 2011. This high water flow scoured the right bank of the river at the gage, then subsequently, filled that portion of the channel by the time Measurement 243 commenced.

Remarks--

Record is considered good due to the number of discharge measurements made this water year, except for periods of ice affected gage height which the record is considered poor. The peak is rated good given the proximity of the discharge Measurement No.242. The stage-discharge relationship has continued to shift left (indicative of channel fill) since the drought of 2002.

Recommendations--

Develop and implement new rating.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07117000 ARKANSAS RIVER AT NEPESTA BRIDGE NEAR NEPESTA, CO

RATING TABLE-- ARKNEPCO16 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

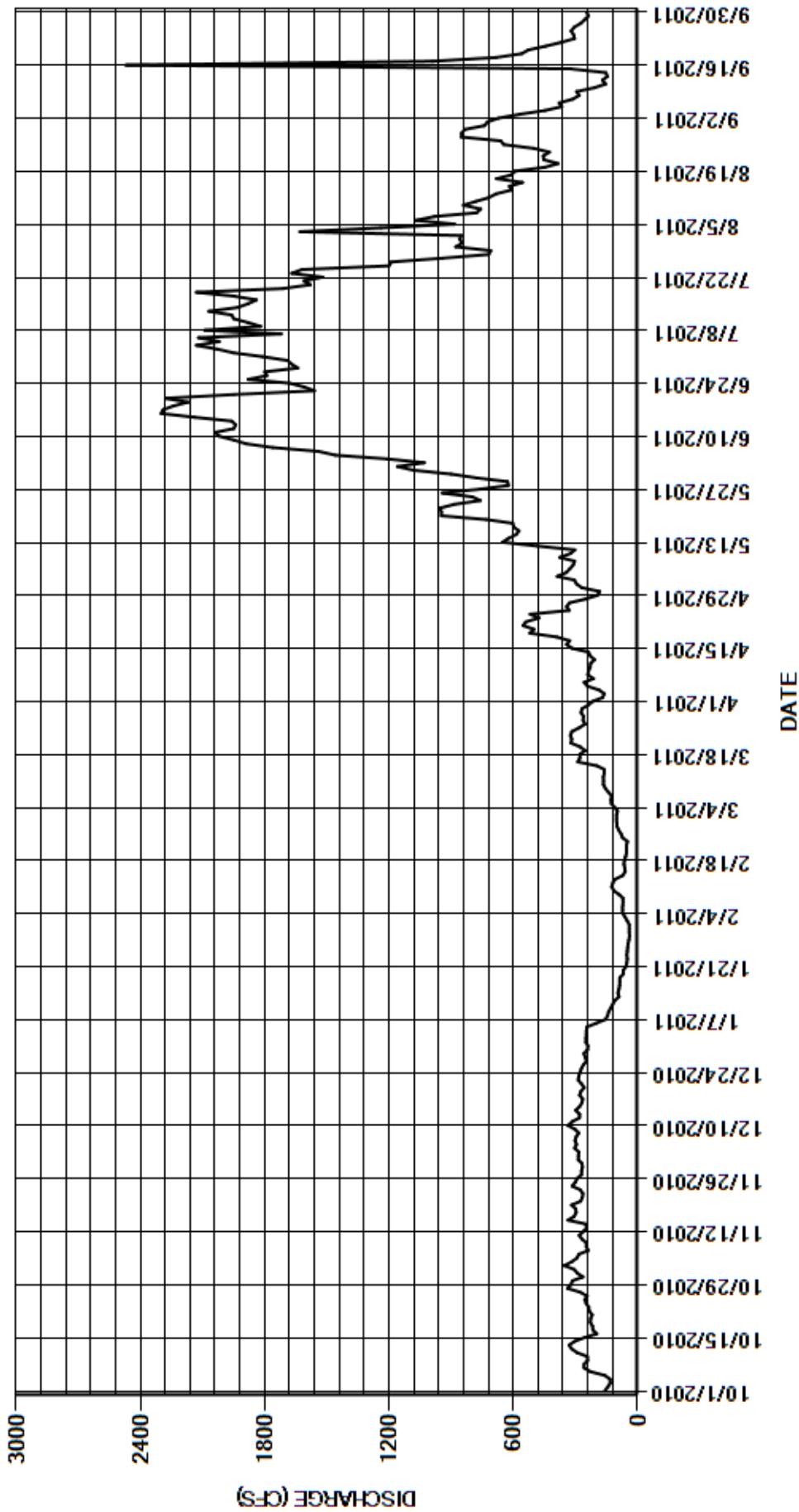
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	158	291	287	e250	e40	102	216	270	1080	1810	858	724
2	143	306	286	e249	e50	102	169	295	1160	1950	852	671
3	132	354	284	e248	e60	97	161	305	1030	2030	1630	569
4	133	318	304	e247	e72	111	187	388	1210	2130	1240	448
5	158	293	295	e245	e72	127	242	344	1460	2020	884	366
6	228	284	302	e200	e72	129	258	327	1540	2120	1070	379
7	258	238	297	e155	e70	125	213	311	1760	1720	981	313
8	258	248	284	e145	e70	141	241	304	1890	2090	777	282
9	241	247	302	e140	e90	156	237	376	1950	1820	758	295
10	243	269	336	e130	e115	165	229	324	2020	1880	841	209
11	292	282	316	e120	e125	164	227	303	2040	1950	781	154
12	318	262	281	e110	e120	166	208	484	1950	1960	718	170
13	331	245	280	e90	e110	161	229	652	1940	2070	683	146
14	304	252	299	e95	e72	161	237	624	1960	1930	608	153
15	256	336	280	e90	60	198	317	587	2140	1880	619	323
16	197	306	269	e87	62	289	343	573	2300	1840	556	2470
17	216	297	265	e86	66	279	328	598	2290	1950	681	990
18	218	299	280	86	64	279	391	603	2240	2130	610	683
19	228	319	274	69	58	253	520	731	2170	1710	592	560
20	227	275	258	69	53	278	500	948	2280	1580	448	527
21	219	267	271	56	53	322	553	947	1950	1610	384	443
22	234	264	287	52	54	318	539	955	1560	1520	453	368
23	236	277	284	50	49	324	476	886	1610	1670	456	305
24	248	316	278	52	73	318	519	759	1680	1620	426	309
25	255	301	272	50	80	282	330	799	1880	1200	501	321
26	244	292	262	48	91	254	343	943	1790	1190	646	306
27	279	271	246	46	100	264	329	763	1800	943	661	275
28	339	271	253	42	101	261	251	624	1640	719	851	255
29	322	266	259	39	---	273	194	628	1670	709	850	237
30	314	269	242	40	---	269	183	778	1690	878	834	247
31	264	---	e240	e40	---	239	---	901	---	846	740	---
TOTAL	7493	8515	8673	3426	2102	6607	9170	18330	53680	51475	22989	13498
MEAN	242	284	280	111	75.1	213	306	591	1789	1660	742	450
AC-FT	14860	16890	17200	6800	4170	13100	18190	36360	106500	102100	45600	26770
MAX	339	354	336	250	125	324	553	955	2300	2130	1630	2470
MIN	132	238	240	39	40	97	161	270	1030	709	384	146
CAL YR	2010	TOTAL	204264	MEAN	560	MAX	3610	MIN	132	AC-FT	405200	
WTR YR	2011	TOTAL	205958	MEAN	564	MAX	2470	MIN	39	AC-FT	408500	

MAX DISCH: 3920 CFS AT 12:00 ON SEP 16,2011 GH 15.04 FT SHIFT -0.04 FT

MAX GH: 15.04 FT AT 12:00 ON SEP 16,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07117000 ARKANSAS RIVER AT NEPESTA BRIDGE NEAR NEPESTA, CO
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN

07117000 ARKANSAS RIVER AT NEPESTA ROAD BRIDGE NEAR NEPESTA, CO (COMBINED)

Water Year 2011

Location.--	Combined record from Arkansas River at Nepesta Rd. Bridge gage: Lat 38° 10' 44", Long 104° 8' 20", in the NE $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ Sec.32, T21S, R60W Pueblo County, Hydrologic Unit 11020005 and Oxford Farmers Ditch gage: Lat. 38° 10'34", Long. 104°08'42", in the NE $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ Sec.32, T21S, R60W Pueblo County, Hydrologic Unit 11020005.
Drainage Area and Period of Record.--	9,345 mi ² .
Equipment.--	See individual records for gage equipment descriptions.
Hydrologic Conditions.--	See individual station analyses.
Gage-Height Record.--	See individual records for gage height record analyses.
Datum Corrections.--	See individual station analyses.
Rating.--	See individual station analyses.
Discharge.--	The combined record of mean daily discharge was obtained by the addition of Oxford Farmers Ditch mean daily flows to the corresponding mean daily flows in the Arkansas River at Nepesta Road Bridge. Mean daily discharge was estimated on the following days: December 31, 2010; January 1 – 17, 31; February 1 – 14, 2011 when ice at or near the ARKNEPCO gage appeared to have affected the stage-discharge relationship. The peak unit value discharge for the year was 4040 cfs which occurred at 12:00 September 16, 2011.
Special Computations.--	See individual station analyses.
Remarks.--	Combined record is fair, except during periods of estimated flow, which should be considered poor. The Arkansas River near Nepesta CO gaging station was moved from above the Oxford Farmers Ditch diversion to the Nepesta Road bridge below the diversion beginning October 1, 2000. For consistency and comparison with previously published historical record in this reach of the Arkansas River, the total Arkansas River flow is computed by combining the Oxford Ditch mean daily discharge with the mean daily discharge measured at Arkansas River at Nepesta Road Bridge near Nepesta CO gaging station. Record developed by Division 2 Staff.
Recommendations.--	See individual station analyses.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07117000 ARKANSAS RIVER AT NEPESTA ROAD BRIDGE NEAR NEPESTA, CO (COMBINED)

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

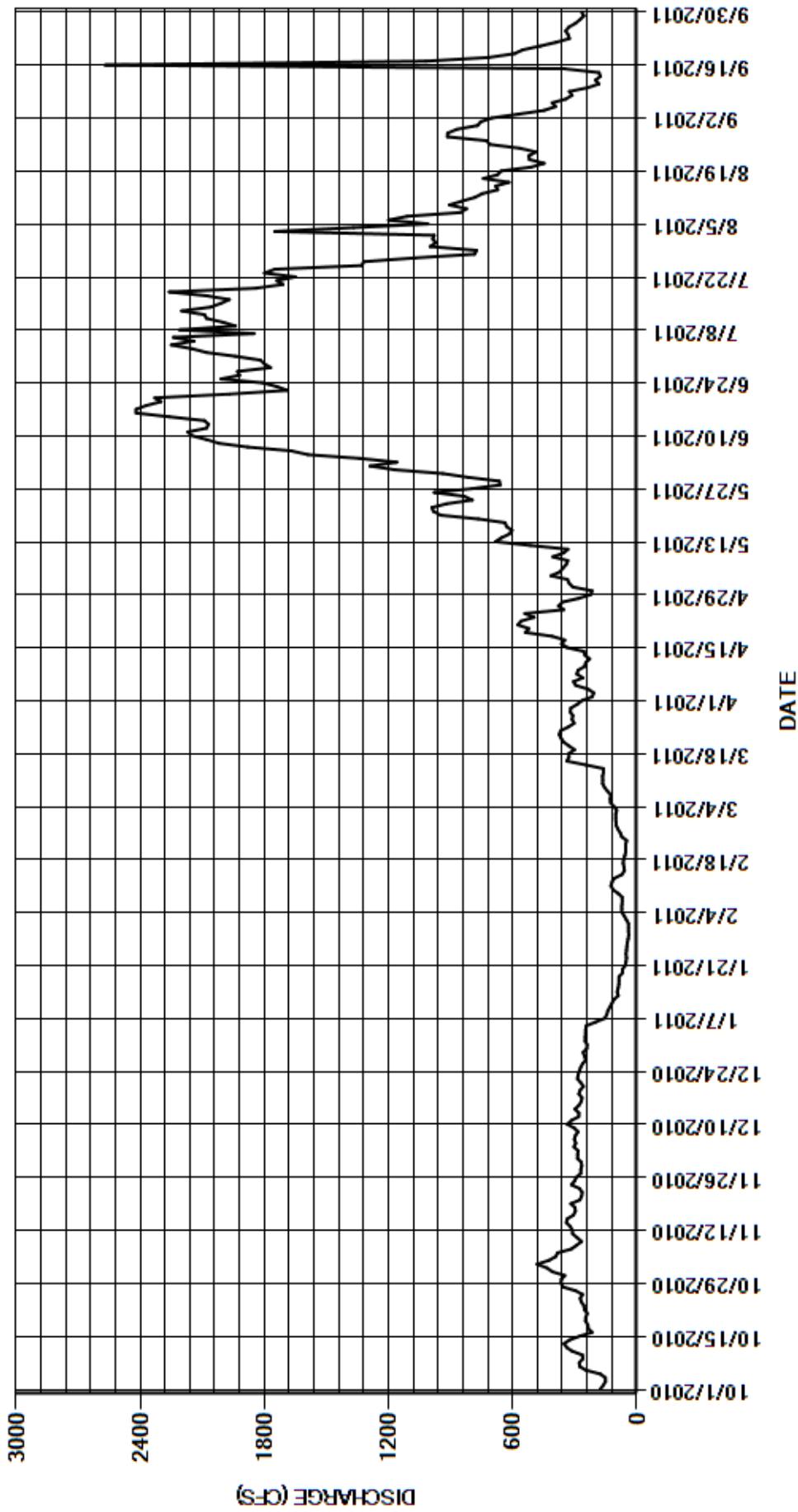
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	177	408	287	e250	e40	102	265	309	1170	1940	986	754
2	162	434	286	e249	e50	102	216	327	1290	2080	980	701
3	151	482	284	e248	e60	97	208	335	1160	2150	1750	572
4	152	425	304	e247	e72	111	235	415	1340	2250	1370	448
5	177	392	295	e245	e72	127	295	372	1590	2140	1010	393
6	247	383	302	e200	e72	129	306	357	1670	2240	1200	409
7	277	317	297	e155	e70	125	261	341	1880	1850	1110	343
8	278	291	284	e145	e70	141	290	334	2020	2210	853	313
9	261	267	302	e140	e90	156	284	406	2080	1940	823	326
10	263	288	336	e130	e115	165	253	354	2150	2000	906	237
11	312	310	316	e120	e125	164	247	333	2170	2080	846	183
12	339	312	281	e110	e120	166	228	514	2080	2090	783	200
13	352	322	280	e90	e110	161	251	683	2070	2200	747	176
14	324	341	299	e95	e72	161	256	655	2090	2060	672	183
15	275	336	280	e90	60	247	337	617	2260	2010	682	349
16	216	306	269	e87	62	339	364	603	2420	1970	618	2570
17	235	297	265	e86	66	328	348	630	2420	2080	742	1020
18	237	299	280	86	64	328	410	637	2370	2260	673	714
19	248	319	274	69	58	301	539	766	2300	1840	656	591
20	247	275	258	69	53	328	521	948	2330	1710	511	552
21	239	267	271	56	53	353	575	983	1970	1740	448	467
22	254	264	287	52	54	366	560	991	1690	1650	519	390
23	255	277	284	50	49	375	497	921	1740	1800	522	326
24	268	316	278	52	73	369	541	795	1810	1750	488	332
25	274	301	272	50	80	331	353	835	2010	1330	566	344
26	262	292	262	48	91	303	379	979	1920	1320	711	329
27	297	271	246	46	100	313	361	798	1930	1070	726	297
28	358	271	253	42	101	309	281	660	1770	784	915	275
29	366	266	259	39	---	322	223	665	1800	774	914	256
30	365	269	242	40	---	319	216	815	1820	999	870	267
31	348	---	e240	e40	---	288	---	938	---	972	770	---
TOTAL	8216	9598	8673	3426	2102	7426	10100	19316	57320	55289	25367	14317
MEAN	265	320	280	111	75.1	240	337	623	1911	1784	818	477
AC-FT	16300	19040	17200	6800	4170	14730	20030	38310	113700	109700	50320	28400
MAX	366	482	336	250	125	375	575	991	2420	2260	1750	2570
MIN	151	264	240	39	40	97	208	309	1160	774	448	176
CAL YR	2010	TOTAL	220835	MEAN	605	MAX	3730	MIN	145	AC-FT	438000	
WTR YR	2011	TOTAL	221150	MEAN	606	MAX	2570	MIN	39	AC-FT	438700	

MAX DISCH: 4040 CFS AT 12:00 ON SEP 16,2011

MAX GH: 0.00 FT

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07117000 ARKANSAS RIVER AT NEPESTA ROAD BRIDGE NEAR NEPESTA, CO (COMBINED)
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
07119700 ARKANSAS RIVER AT CATLIN DAM NEAR FOWLER
Water Year 2011

Location.--	Lat. $38^{\circ}07'33''$, Long. $103^{\circ}54'41''$, in NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 21, T.22 S., R.58 W., Otero County, Hydrologic Unit 11020005, at Catlin Canal gage, on right bank 2.2 mi downstream from diversion dam for Catlin Canal, 2.3 mi downstream from Apishapa River, and 6.0 mi east of Fowler.
Drainage Area and Period of Record.--	10,901 mi 2 . October 1964 to current year.
Equipment.--	Satellite-monitored data collection platform (Sutron Satlink 2 DCP) with Sutron Constant Flow Bubbler (CFB) housed in an 8 ft x 8 ft shelter. This DCP also monitors the Catlin Canal's flume gage height and USGS water quality sensors. The primary reference gage is an outside staff gage which is attached to a concrete flood block that holds the bubbler orifice. A cableway approximately 2 miles upstream of the gage was used for high flow measurements. The 8210 platform was replaced with the Satlink 2 platform on July 28, 2011. No other changes were made this water year.
Hydrologic Conditions.--	The drainage basin which contributes to the gage encompasses approximately 10,800 square miles. Basin characteristics include elevation differences from Mt. Elbert at $14,433 \pm$ ft to the gage at elevation $4,245 \pm$ ft with vegetation ranging from alpine tundra to sparse pinon-juniper in the upper reaches and from irrigated farmland to rangeland in the lower reaches. The gage is located downstream from Pueblo Reservoir approximately 61 miles. Pueblo Reservoir regulates flows through the reservoir year round including the Winter Water Storage Program period of November 15 to March 15 when the gates are essentially closed and streamflow is stored for release during the irrigation season. Release of water from Pueblo Reservoir takes approximately 38 hours to reach the gage. Unregulated tributaries below Pueblo Reservoir that contribute to the gage include Fountain Creek, St. Charles River, Huerfano River and the Apishapa River. The Apishapa River's confluence with the Arkansas River is approximately 2.4 miles above the gage. Numerous irrigation diversion points exist above the gage including Catlin Canal operations which sluice approximately 0.24 miles above the gage and also divert from the river approximately 2.25 miles above the gage. All of these factors influence streamflow at the gage. Mean annual precipitation for the basin is $17.09 \pm$ inches. No hydrologic conditions changes in the basin observed this water year.
Gage-Height Record.--	Primary record is 15-minute satellite transmitted CFB data, with DCP log backup. Record is complete and reliable, except for the following periods: December 30-31, 2010, January 1-15, February 2, 5-6, 10, 2011 when ice affected the recorded gage heights. This period was flagged and flow estimates were compared and computed using downstream gages. July 28, 2011 had four missing values during the installation of the Satlink 2 were filled using linear regression between adjacent values with minimal loss of accuracy. Primary stage sensor calibration to the reference gage is supported by 27 visits made this water year.
Datum Corrections.--	Levels were last run on August 22, 2008. No corrections were made this water year.
Rating.--	A shifting sand channel is the control at all stages with heavily vegetated bank areas contributing to the flow during high gage heights of 9.5 feet and above. Rating curve ARKCACCO11, dated June 26, 2003, was used for the entire water year. Twenty-seven discharge measurements (Nos. 1207-1233) were made throughout the water year covering a range in discharge from 60.6 to 1760 cfs. The measurements cover the range in stage except for lower flows that occurred October 7 and November 9, 2010; and January 25-27, January 29 through February 1, February 8, and 16 through March 5 , March 9 and 20, 2011; and, higher flows that occurred June 15, 19-21, July 8, and 12-14, 2011. The peak discharge of 2930 cfs occurred at 2030 on September 16, 2011 at a gage height of 5.59 ft with a shift of -0.32 ft.
Discharge.--	Shifting sand channel control method was used to compute discharge for the entire water year. Shifts were applied as defined by measurements and distributed by time, event, and stage. Shifts were prorated by time from the beginning of the water year to the start of the ascending limb of a peak on August 3. Variable stage-shift relation ARKCACCOVS11 was applied from 1430 August 3 to 1000 August 5, 2011. Shifts were time prorated from this period to 1200 September 6, 2011; immediately before Measurement No. 1231. The measurement's shift of -0.13 ft was held constant to 0630 September 16, 2011 for a seamless transition onto the variable shift curve ARKCACCOVS11 at 0645 September 16, 2011. On the descending limb of the peak, shifts were prorated to Measurement No. 1232 completed on 1245 September 19, 2011. From 1300 September 19 to the end of the water year shifts were again prorated by time. All measurement were given full weight.
Special Computations.--	The potential for ice-affected gage heights were analyzed using on-site USGS water temperature data, ARKNPNEPCO air temperature data, gage height time series traces, field measurement notes and downstream hydrographs. Discharge estimated by using ARKCACCO adjacent ice free data, upstream hydrographs from ARKNPNEPCO, and downstream hydrographs from ARKROCCO and FLSCANCO. Shift curve data was supplemented with data from water years 2009 and 2010 to help define shifts at higher and lower gage heights than measured in 2011.
Remarks.--	Record is good, except the ice effected periods which are estimated and poor. Flows for gage heights above 4.47 ft were not well defined via the variable shift curve and are rated fair. The instantaneous peak for the year is also rated fair. Station maintained by Div 2 staff and record developed by Garrett Markus.
Recommendations.--	Levels should be run in WY2012. All chiseled benchmarks should be replaced with either a brass cap or concrete pin for improved accuracy during levels. Measurement should be made at the established frequency for sand channel gages. Since this record is effected by sluice operations on the Catlin Canal, it is recommended that more measurements be taken at the sluice to verify the sluice structure rating CATSLUCO02.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07119700 ARKANSAS RIVER AT CATLIN DAM NEAR FOWLER

RATING TABLE-- ARKCACCO11 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

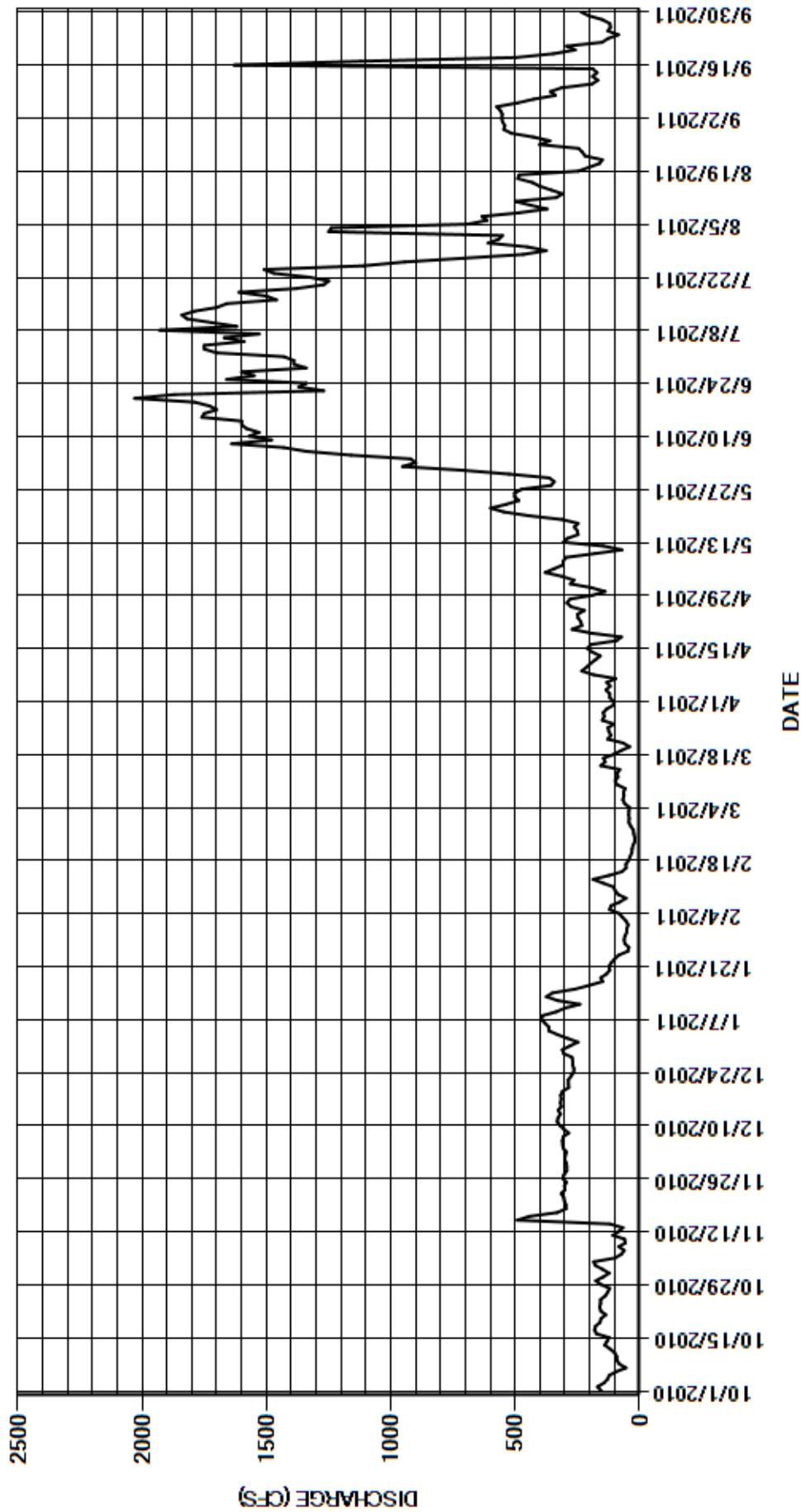
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	154	122	301	e247	46	42	105	193	711	1430	567	551
2	169	148	299	e290	e55	43	120	278	953	1700	551	554
3	143	177	294	e330	69	43	120	264	900	1750	1250	552
4	129	184	307	e365	83	41	135	312	920	1750	1240	560
5	122	99	309	e365	e120	60	118	379	1160	1590	689	574
6	94	73	310	e380	e115	67	132	344	1340	1670	613	491
7	55	62	307	e395	80	63	95	308	1430	1530	634	425
8	81	83	285	e390	54	64	185	307	1640	1930	484	338
9	91	57	304	e335	86	58	233	296	1480	1620	372	358
10	92	61	320	e300	e98	91	213	180	1570	1720	438	314
11	100	107	331	e240	105	98	197	71	1530	1820	500	191
12	119	84	328	e330	147	87	177	146	1580	1840	335	168
13	140	67	318	e375	187	90	158	306	1600	1790	309	189
14	131	120	327	e350	123	80	190	291	1600	1700	355	171
15	122	491	315	e260	71	156	210	248	1760	1660	401	188
16	173	443	318	202	54	138	195	250	1750	1460	431	1630
17	181	331	315	148	55	145	93	262	1700	1500	489	1120
18	177	296	317	156	44	103	73	247	1730	1610	484	496
19	159	296	310	133	38	74	194	312	1790	1380	246	346
20	155	302	285	120	31	40	271	445	2030	1270	203	259
21	136	305	286	123	30	66	232	545	1870	1250	161	293
22	156	315	287	113	26	128	236	599	1270	1330	150	151
23	160	300	276	100	19	115	247	537	1370	1470	219	127
24	157	302	265	83	19	123	249	485	1340	1510	230	85
25	157	294	264	47	23	127	222	502	1660	1110	245	127
26	138	309	269	43	25	103	276	502	1550	945	402	117
27	128	304	268	59	35	150	292	474	1600	704	361	120
28	120	293	272	62	43	142	279	356	1340	467	428	150
29	155	293	305	59	---	146	189	343	1390	375	516	203
30	176	294	e310	52	---	132	139	363	1390	452	546	235
31	146	---	e280	51	---	104	---	525	---	609	542	---
TOTAL	4216	6612	9282	6503	1881	2919	5575	10670	43954	42942	14391	11083
MEAN	136	220	299	210	67.2	94.2	186	344	1465	1385	464	369
AC-FT	8360	13110	18410	12900	3730	5790	11060	21160	87180	85180	28540	21980
MAX	181	491	331	395	187	156	292	599	2030	1930	1250	1630
MIN	55	57	264	43	19	40	73	71	711	375	150	85
CAL YR	2010	TOTAL	173549	MEAN	475	MAX	3350	MIN	28	AC-FT	344200	
WTR YR	2011	TOTAL	160028	MEAN	438	MAX	2030	MIN	19	AC-FT	317400	

MAX DISCH: 2930 CFS AT 20:30 ON SEP 16,2011 GH 5.59 FT SHIFT -0.32 FT

MAX GH: 5.59 FT AT 20:30 ON SEP 16,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07119700 ARKANSAS RIVER AT CATLIN DAM NEAR FOWLER
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
07119705 CATLIN CANAL AT CATLIN DAM NEAR FOWLER
Water Year 2011

Location.--	Lat. 38°07'33", Long. 103°54'41", in NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 21, T.22 S., R.58 W., Otero County, Hydrologic Unit 11020005, at river gage.
Drainage Area and Period of Record.--	N/A
Equipment.--	Float-activated graphic water-stage recorder and shaft encoder in 8 ft x 8 ft shelter with well (with equipment for Arkansas River below Catlin Dam near Fowler CO river gage). Shaft encoder is connected to satellite-monitored data collection platform (DCP) used for river gage. Fifteen-foot standard concrete Parshall flume is the control. Primary reference gage is outside staff gage installed in flume.
Hydrologic Conditions.--	The Catlin Canal diverts water from the Arkansas River just downstream from the confluence of the Apishapa River. The Catlin Canal Company owns a variety of both native and transmountain water rights and thus the hydrologic characteristics of the basins are highly variable. The influence of urbanization provides the largest affect to the runoff regime.
Gage-Height Record.--	Primary record is 15-minute satellite data with the graphic chart recorder and DCP log used for backup purposes. Record is complete and reliable for this seasonally operated gage. Ten shaft encoder calibration corrections ranging from -0.10 ft to +0.03 ft were made during periods of operation during the year. All corrections were applied by time proration from the previous visit.
Datum Corrections.--	Levels were last run 8 Oct 2003. No corrections needed. The 2003 level survey did identify the flume floor is not level and the floor at the upstream right corner was found to be 0.05 feet higher than the floor at the intakes/staff gage.
Rating.--	A standard 15-ft Parshall Flume table was used all year. One discharge measurement (No. 20 – July 1, 2011) of 328 cfs was made this year. The peak flow of 362 cfs occurred at 0830 on June 8, 2011 at a gage height of 3.15 ft with a shift of 0.00 ft. The peak exceeded the stage of measurement No. 20 by 0.26 feet.
Discharge.--	Measurement Number 20 was discounted 4 percent to a 0.00 ft shift. Adjusting measurements to provide for a zero shift has been the historical practice at this structure. Discharge record was computed by direct application of the standard rating to the gage height record. The standard 15-foot Parshall flume rating remains applicable as the R-Error over an 8-year period averages 1.59%.
Special Computations.--	No special computations were necessary this water year.
Remarks.--	The record is good. Station maintained and record developed by Garrett Markus.
Recommendations.--	A levels survey and flume inspection should be performed during the non irrigation season to confirm the floor elevations and the position of the staff gage.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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07119705 CATLIN CANAL AT CATLIN DAM NEAR FOWLER

RATING TABLE-- STD15FTP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

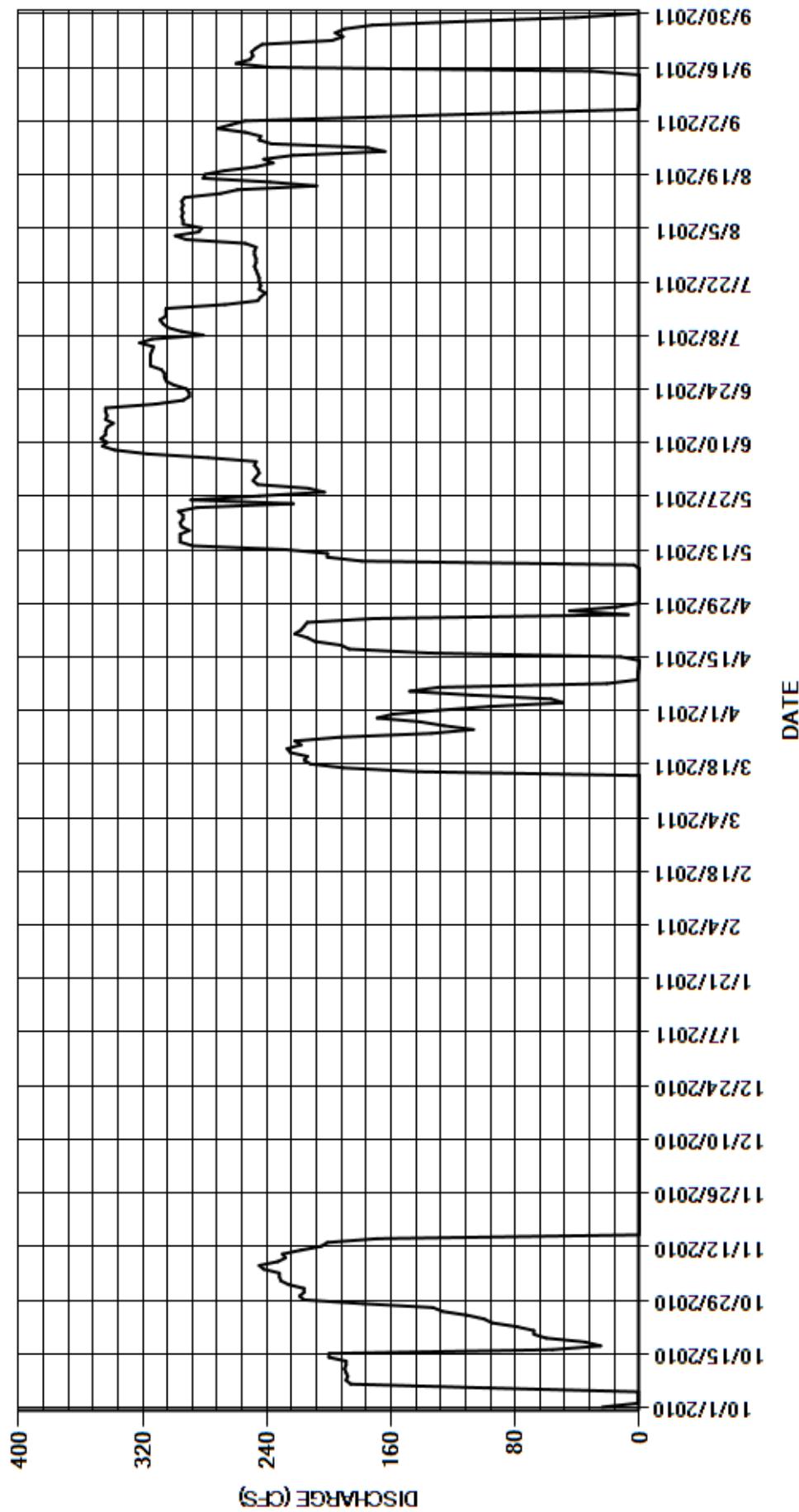
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	24	216	0.00	0.00	0.00	0.00	130	0.11	247	315	254	263
2	0.82	226	0.00	0.00	0.00	0.00	97	0.05	245	315	292	254
3	0.75	231	0.00	0.00	0.00	0.00	49	0.03	246	315	299	172
4	0.64	232	0.00	0.00	0.00	0.00	57	0.00	248	314	284	88
5	0.64	232	0.00	0.00	0.00	0.00	108	0.00	247	313	282	1.0
6	97	242	0.00	0.00	0.00	0.00	148	0.00	278	322	294	0.48
7	186	245	0.00	0.00	0.00	0.00	130	0.00	317	314	294	0.15
8	189	233	0.00	0.00	0.00	0.00	21	0.00	338	281	295	0.03
9	188	228	0.00	0.00	0.00	0.00	1.0	3.6	346	295	294	0.00
10	189	230	0.00	0.00	0.00	0.00	1.0	179	343	304	295	0.00
11	190	218	0.00	0.00	0.00	0.00	0.86	201	347	307	294	0.00
12	189	205	0.00	0.00	0.00	0.00	0.44	201	344	309	295	0.00
13	189	201	0.00	0.00	0.00	0.00	0.00	228	344	305	293	0.00
14	200	169	0.00	0.00	0.00	0.00	0.00	288	343	305	270	0.00
15	200	0.25	0.00	0.00	0.00	0.00	12	296	339	305	259	31
16	56	0.00	0.00	0.00	0.00	143	136	296	344	267	208	238
17	25	0.00	0.00	0.00	0.00	191	187	296	343	246	238	260
18	35	0.00	0.00	0.00	0.00	212	192	290	344	244	281	251
19	60	0.00	0.00	0.00	0.00	216	209	295	344	241	280	249
20	68	0.00	0.00	0.00	0.00	214	214	296	312	245	267	250
21	68	0.00	0.00	0.00	0.00	225	222	294	294	244	247	247
22	79	0.00	0.00	0.00	0.00	227	218	294	290	245	236	243
23	95	0.00	0.00	0.00	0.00	218	216	297	290	245	242	198
24	100	0.00	0.00	0.00	0.00	222	214	285	292	246	223	191
25	111	0.00	0.00	0.00	0.00	193	171	223	300	247	164	196
26	127	0.00	0.00	0.00	0.00	134	7.2	289	305	248	175	190
27	133	0.00	0.00	0.00	0.00	107	45	245	306	247	237	172
28	178	0.00	0.00	0.00	0.00	126	15	203	306	247	245	112
29	216	0.00	0.00	0.00	---	141	0.14	213	308	248	244	41
30	219	0.00	0.00	0.00	---	169	0.11	246	315	248	254	2.1
31	216	---	0.00	0.00	---	159	---	249	---	247	272	---
TOTAL	3629.85	3108.25	0.00	0.00	0.00	2897.00	2801.75	5707.79	9265	8574	8107	3649.76
MEAN	117	104	0.000	0.000	0.000	93.5	93.4	184	309	277	262	122
AC-FT	7200	6170	0	0	0	5750	5560	11320	18380	17010	16080	7240
MAX	219	245	0.00	0.00	0.00	227	222	297	347	322	299	263
MIN	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	245	241	164	0.00
CAL YR	2010	TOTAL	48325.10	MEAN	132	MAX	322	MIN	0.00	AC-FT	95850	
WTR YR	2011	TOTAL	47740.40	MEAN	131	MAX	347	MIN	0.00	AC-FT	94690	

MAX DISCH: 362 CFS AT 08:30 ON JUN 08,2011 GH 3.15 FT SHIFT 0 FT

MAX GH: 3.15 FT AT 08:30 ON JUN 08,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07119705 CATLIN CANAL AT CATLIN DAM NEAR FOWLER
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
ARKANSAS RIVER AND CATLIN CANAL (COMBINED)
Water Year 2011

Location.--	Combined record from Arkansas River below Catlin Dam and Catlin Canal gages both located at Lat 38°07'33", long 103°54'41", in NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 21, T.22 S., R.58 W., Otero County.
Drainage Area and Period of Record.--	10,901 mi ² .
Equipment.--	See individual records for gage equipment descriptions.
Hydrologic Conditions.--	See individual station analyses.
Gage-Height Record.--	See individual records for gage height record analyses.
Datum Corrections.--	See individual station analyses.
Rating.--	See individual station analyses.
Discharge.--	The combined record of discharges was obtained by the addition of Catlin Canal daily flows to the corresponding daily flows in the Arkansas River below Catlin Dam. The peak unit value discharge for the year was 3220 cfs at 2045 on September 16, 2011. See individual station analyses.
Special Computations.--	
Remarks.--	Combined record is good, except during periods of estimated flow, which should be considered poor. Record developed by Div. 2 hydrographic staff.
Recommendations.--	

STATE OF COLORADO
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ARKANSAS RIVER AND CATLIN CANAL (COMBINED)

RATING TABLE--

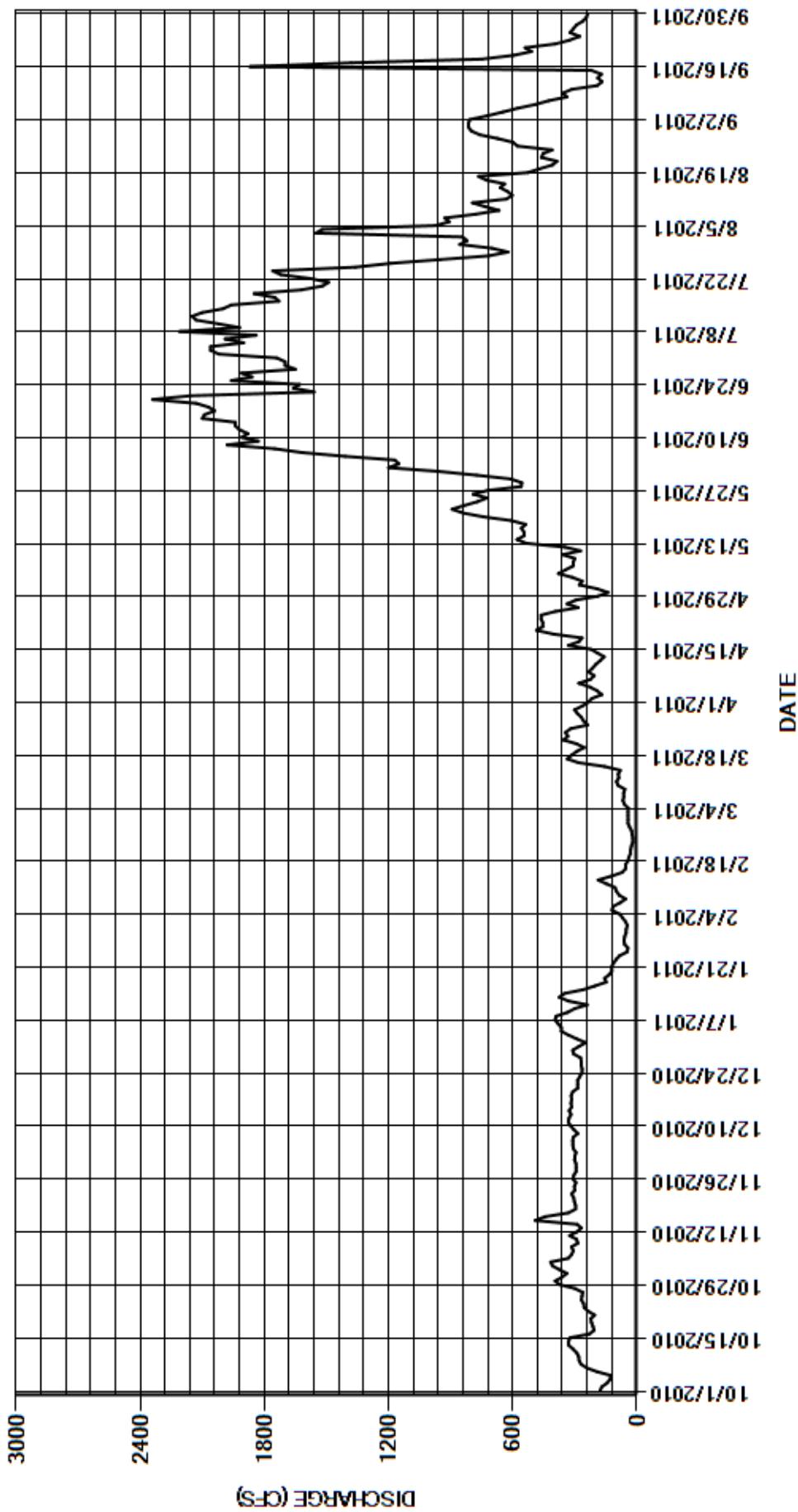
DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011												
DAY	MEAN VALUES											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	178	338	301	e247	46	42	235	193	958	1740	821	814
2	170	374	299	e290	e55	43	217	278	1200	2020	843	808
3	144	408	294	e330	69	43	169	264	1150	2060	1550	724
4	130	416	307	e365	83	41	192	312	1170	2060	1520	648
5	123	331	309	e365	e120	60	226	379	1410	1900	971	575
6	191	315	310	e380	e115	67	280	344	1620	1990	907	491
7	241	307	307	e395	80	63	225	308	1750	1840	928	425
8	270	316	285	e390	54	64	206	307	1980	2210	779	338
9	279	285	304	e335	86	58	234	300	1830	1920	666	358
10	281	291	320	e300	e98	91	214	359	1910	2020	733	314
11	290	325	331	e240	105	98	198	272	1880	2130	794	191
12	308	289	328	e330	147	87	177	347	1920	2150	630	168
13	329	268	318	e375	187	90	158	534	1940	2100	602	189
14	331	289	327	e350	123	80	190	579	1940	2000	625	171
15	322	491	315	e260	71	156	222	544	2100	1960	660	219
16	229	443	318	202	54	281	331	546	2090	1730	639	1870
17	206	331	315	148	55	336	280	558	2040	1750	727	1380
18	212	296	317	156	44	315	265	537	2070	1850	765	747
19	219	296	310	133	38	290	403	607	2130	1620	526	595
20	223	302	285	120	31	254	485	741	2340	1520	470	509
21	204	305	286	123	30	291	454	839	2160	1490	408	540
22	235	315	287	113	26	355	454	893	1560	1580	386	394
23	255	300	276	100	19	333	463	834	1660	1720	461	325
24	257	302	265	83	19	345	463	770	1630	1760	453	276
25	268	294	264	47	23	320	393	725	1960	1360	409	323
26	265	309	269	43	25	237	283	791	1860	1190	577	307
27	261	304	268	59	35	257	337	719	1910	951	598	292
28	298	293	272	62	43	268	294	559	1650	714	673	262
29	371	293	305	59	---	287	189	556	1700	623	760	244
30	395	294	e310	52	---	301	139	609	1700	700	800	237
31	362	---	e280	51	---	263	---	774	---	856	814	---
TOTAL	7847	9720	9282	6503	1881	5816	8376	16378	53218	51514	22495	14734
MEAN	253	324	299	210	67.2	188	279	528	1774	1662	726	491
AC-FT	15560	19280	18410	12900	3730	11540	16610	32490	105600	102200	44620	29220
MAX	395	491	331	395	187	355	485	893	2340	2210	1550	1870
MIN	123	268	264	43	19	41	139	193	958	623	386	168
CAL YR	2010	TOTAL	221929	MEAN	608	MAX	3670	MIN	104	AC-FT	440200	
WTR YR	2011	TOTAL	207764	MEAN	569	MAX	2340	MIN	19	AC-FT	412100	

MAX DISCH: 3220 CFS AT 20:45 ON SEP 16,2011

MAX GH: 0.00 FT

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ARKANSAS RIVER AND CATLIN CANAL (COMBINED)
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
ARKANSAS RIVER NEAR ROCKY FORD
Water Year 2011

Location.--	Lat. 38°03'52", Long. 103°41'24" in SE ¼, NW ¼, Sec. 9, T23S, R56W, Hydrologic Unit 11020005, Otero County, on right bank of Arkansas River, approximately 250 feet upstream from State Highway 266, and approximately 1.6 miles NE of Rocky Ford, Colorado.
Drainage Area and Period of Record.--	11,438 sq. mi. Gage established October 8, 1992.
Equipment.--	Sutron 8210 DCP with a Sutron Constant Flow Bubbler (CFB) in a 4 ft x 4 ft steel gage shelter with a tipping bucket rain gage. The CFB orifice line terminates in the channel on the streamside of a concrete floodblock situated on the right edge of water below the shelter. The primary reference gage is the top of an angle iron installed on a floodblock with a drop tape reference point.
Hydrologic Conditions.--	The drainage basin which contributes to the gage encompasses approximately 11,300 square miles. Basin characteristics include elevation differences from Mt. Elbert at 14,433 ft to the gage at elevation 4,131 ft with vegetation ranging from alpine tundra to sparse pinon-juniper in the upper reaches and from irrigated farmland to rangeland in the lower reaches. The gage is located downstream from Pueblo Reservoir approximately 79 miles. Pueblo Reservoir regulates flows through the reservoir year round including the Winter Water Storage Program period of November 15 to March 15 when the gates are essentially closed and streamflow is stored for release during the irrigation season. Release of water from Pueblo Reservoir takes approximately 42 hours to reach the gage. Unregulated tributaries that contribute to the gage include Fountain Creek, St. Charles River, Huerfano River and the Apishapa River. Numerous irrigation diversion points exist above the gage. All of these factors influence steamflow at the gage. Mean annual precipitation for the basin is 16.87± inches. No hydrologic conditions changes in the basin observed this water year.
Gage-Height Record.--	Primary record is 15-minute satellite transmitted CFB data, with DCP log backup. Record is complete and reliable, except for the following periods: Dec. 31, 2010 through Jan. 17, 2011 and Jan. 31 through Feb. 12, 2011, when ice affected the stage-discharge relationship. Satellite data were missing for several hours on each of March 13-14, March 16, May 4, and July 13, 2011. Data replaced with DCP log data without loss of accuracy.
Datum Corrections.--	Levels were last run to the wire weight gage on Sep. 25, 2008 using BM1 as the base. No datum corrections were taken as a result of levels. The elevation of the tapedown RP on the flood block (7.421 ft) was also established on that date. The wire weight gage was recommended to no longer be used on that date as the water surface measured by the wire weight is different than at the flood block/orifice location.
Rating.--	The control is a shifting sand channel with earthen banks at low to medium flows. Rating No. 2, dated Oct. 1, 2003, was used the entire water year. Rating No. 2 has an average rating error of 11% over the last five years indicating that the rating needs updating. Twenty-seven discharge measurements (Nos. 377-403) were made this water year, ranging in discharge and stage from 19.1 cfs (1.22 ft) to 1520 cfs (2.59 ft). WY2011 measurements covered the range in stage experienced except for lower flow days of February 8, 15-20, 2011 and higher flow days of June 8, 15-21, July 18, August 4 and September 17, 2011. The peak instantaneous flow of 2670 cfs occurred at 0300 September 17 at a gage height of 4.20 ft with a shift of -0.09 ft. The peak exceeded the stage of Measurement No. 395, made June 15, 2011, by 0.73 feet.
Discharge.--	Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and distributed by time, event and stage. Shifts were prorated by time from the beginning of the water year to the start of the ascending limb of the peak runoff at 1015 May 23, 2011 . Variable shift curve (ARKROCCOVS123) was used to define the peak flow period from 1015 May 23, 2011 through 1200 July 25, 2011. Variable shift curve (ARKROCCOVS124A) was used to define the receding limb of the peak period hydrograph and a separate event that generated in the Fountain Creek watershed on September 16, 2011. ARKROCCOVS124A was distributed from the periods 1215 July 25, 2011 through 2345 September 30. Measurements showed shifts ranging from -0.11 ft to +0.15 ft. All measurements were given full weight, except Nos. 396-403, which were discounted from -6.62% to +5.69% for smoothing purposes.
Special Computations.--	The potential for ice-affected gage heights was analyzed using NOAA air temperature data from the La Junta Municipal Airport approximately 9 miles away, water temperatures from ARKCATCO, approximately 13 miles away and "b" day data recorded from the Fort Lyon Storage Canal. Discharges on ice affected days and days of missing data were estimated using good record before and after the affected periods and by comparison to upstream hydrographs using the Arkansas River below Catlin Dam and Fort Lyon Storage Canal mean daily flows.
Remarks.--	Record is good for the entire water year, except for periods of ice affect and periods of missing record, which were estimated and are considered poor. Peak gage height and discharge are considered fair. Station maintained by Garrett Markus and record developed by Steve Anselmo.
Recommendations.--	Rating No. 2 needs to be upgraded. Levels need to be run in WY2012. All chiseled benchmarks should be replaced with either a brass cap or concrete pin for improved accuracy during levels.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

ARKANSAS RIVER NEAR ROCKY FORD

RATING TABLE-- ARKROCCO02 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

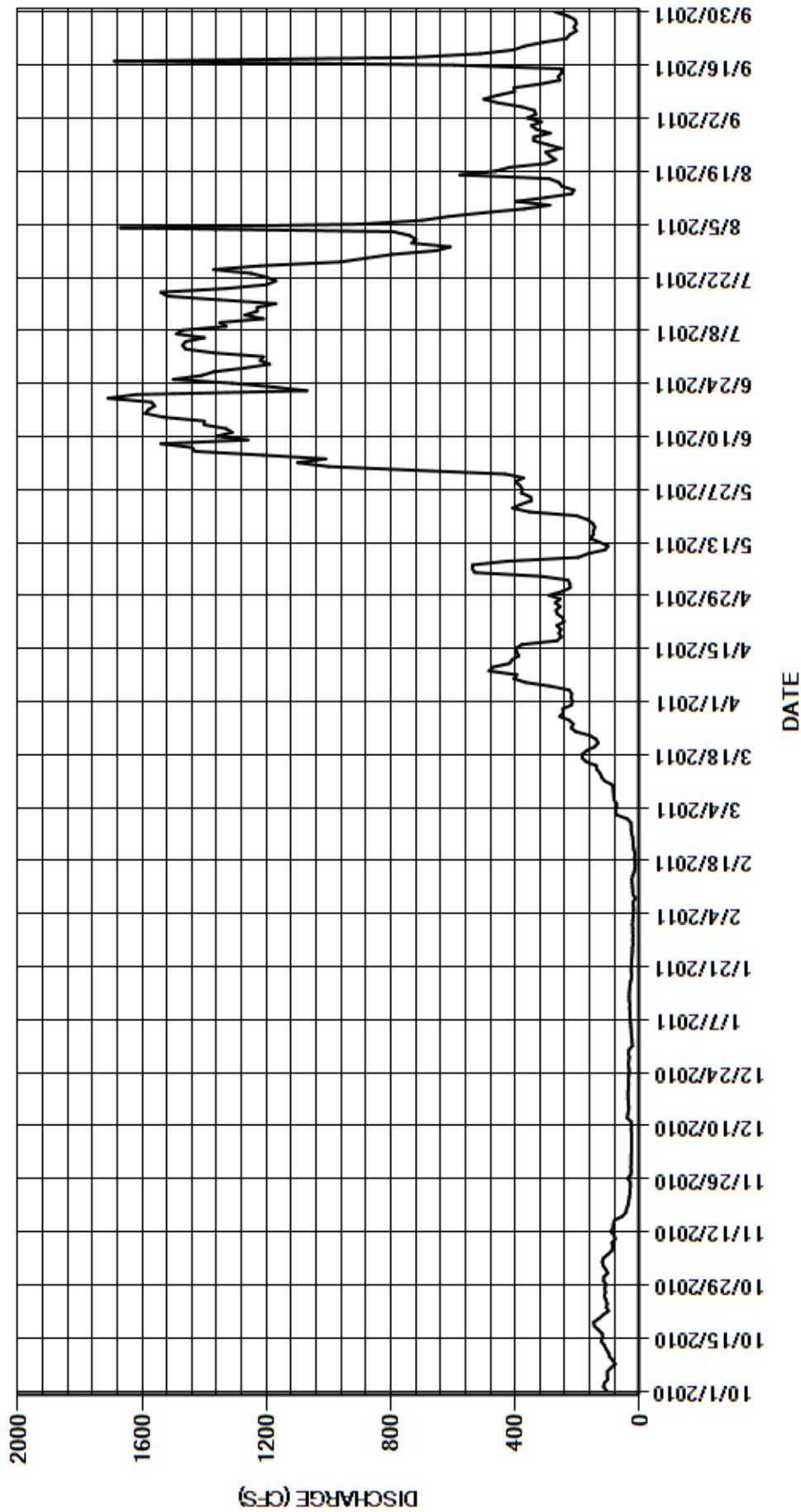
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	106	102	27	e24	e23	40	216	223	724	1210	719	315
2	116	109	27	e25	e22	74	220	224	1000	1370	740	361
3	113	117	26	e26	e21	77	218	230	1100	1460	792	334
4	102	120	25	e27	e20	74	227	317	1010	1470	1670	338
5	104	116	25	e28	e19	74	288	530	1210	1460	896	380
6	104	101	26	e29	e20	82	368	538	1430	1400	699	454
7	92	89	26	e30	e21	83	404	537	1440	1490	615	501
8	78	86	26	e31	e13	84	395	426	1540	1470	502	457
9	86	89	27	e31	e21	84	484	197	1260	1330	372	402
10	97	78	26	e32	e22	89	473	165	1360	1350	289	404
11	100	82	27	e31	e23	113	418	111	1310	1210	396	319
12	108	92	40	e33	e24	122	410	101	1330	1270	302	257
13	114	85	38	e34	25	127	388	128	1400	1230	218	261
14	123	84	35	e33	22	137	396	158	1400	1230	211	250
15	119	80	35	e32	17	139	397	149	1530	1170	250	251
16	120	56	36	e31	15	171	378	148	1590	1350	259	597
17	132	44	37	e29	14	184	265	144	1580	1520	290	1690
18	145	42	37	25	16	184	252	151	1560	1540	578	736
19	148	37	37	26	16	170	259	168	1570	1330	463	512
20	131	35	36	27	15	144	253	203	1710	1200	418	405
21	117	33	35	27	19	133	266	354	1620	1170	301	370
22	100	31	36	25	21	140	243	408	1070	1200	269	310
23	107	31	35	25	21	161	246	382	1180	1250	288	235
24	104	29	33	24	22	206	264	347	1310	1370	302	225
25	109	29	34	23	25	220	269	351	1500	1220	252	203
26	113	38	36	23	27	213	255	380	1410	962	295	211
27	110	28	35	21	27	226	271	377	1370	881	340	203
28	112	27	33	22	28	257	255	385	1270	796	340	208
29	108	28	36	21	---	245	291	400	1190	654	287	232
30	116	27	34	22	---	247	248	373	1220	609	331	271
31	115	---	e23	e22	---	219	---	432	---	733	348	---
TOTAL	3449	1945	989	839	579	4519	9317	9037	40194	37905	14032	11692
MEAN	111	64.8	31.9	27.1	20.7	146	311	292	1340	1223	453	390
AC-FT	6840	3860	1960	1660	1150	8960	18480	17920	79720	75180	27830	23190
MAX	148	120	40	34	28	257	484	538	1710	1540	1670	1690
MIN	78	27	23	21	13	40	216	101	724	609	211	203
CAL YR	2010	TOTAL	143392	MEAN	393	MAX	2800	MIN	23	AC-FT	284400	
WTR YR	2011	TOTAL	134497	MEAN	368	MAX	1710	MIN	13	AC-FT	266800	

MAX DISCH: 2670 CFS AT 03:00 ON SEP 17,2011 GH 4.20 FT SHIFT -0.09 FT

MAX GH: 4.20 FT AT 03:00 ON SEP 17,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ARKANSAS RIVER NEAR ROCKY FORD
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
07122400 CROOKED ARROYO NEAR SWINK, CO
Water Year 2011

Location.--	Lat. $37^{\circ}58'56''$, Long. $103^{\circ}35'52''$, in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 5, T.24 S., R.55 W., Otero County, on right bank 54 ft. downstream from bridge on State Highway 10, 2.0 mi. upstream from mouth, and 2.8 mi. southeast of Swink.
Drainage Area and Period of Record.--	108 mi 2 . Gage established at present site and datum by USGS February 1, 1968. Operated by USGS until September 30, 1993. Operated and maintained by State of Colorado Division of Water Resources from October 1, 1993 to present.
Equipment.--	High data rate Sutron Satlink 2 DCP and Sutron Constant Flow Bubbler (CFB) installed in a 4 ft x 4 ft steel shelter. Primary reference gage is a staff gage in the channel. The 8210 platform was replaced with the Satlink 2 platform on July 28, 2011. No other changes were made this water year.
Hydrologic Conditions.--	The drainage basin which contributes to the gage encompasses approximately 108 square miles. Basin characteristics include land uses primarily of rangeland with the lower portion of the basin used as irrigated agricultural land. Surface cover in the rangeland area is primarily native grasses and weeds. Streamflow exhibits considerable seasonal variability with the majority of the total annual streamflow resulting from short duration summer thunderstorms and snowmelt runoff contributing in the minor. Mean annual precipitation for the basin is $13.42 \pm$ inches. Flows at the gaging station can be affected by minor irrigation diversions from the channel and highly variable irrigation return flows from the Catlin Canal. Flows can also be regulated by two reservoirs in the upstream basin as well as by beaver dams. No hydrologic conditions changes in the basin observed this water year.
Gage-Height Record.--	Primary record is 15-minute satellite-monitored constant flow bubbler data, with DCP log backup. Record is complete and reliable, except for the following periods: November 24, 2010 thru November 30, 2010; when the gage height was affected by ice. The six missing values during the installation of the Satlink 2 were filled using linear regression between the two known values with minimal loss of accuracy. Many random days had one or two missing unit values per day. These were filled in from the DCP log without loss of accuracy. Primary stage sensor calibration to the reference gage is supported by 15 visits made this water year.
Datum Corrections.--	Levels were last run August 22, 2008. No corrections were made.
Rating.--	The control is a sand, gravel, clay, and mud channel with earthen banks. Bank vegetation of variable density affects medium to high flows considerably. During low flow periods in the winter months considerable moss/algae growth appears in the channel bottom affecting the stage-discharge relationship. Rating No. 7, was used the entire water year. It is well defined to approximately 100 cfs. Fifteen discharge measurements (Nos. 277-291) were made this water year ranging in discharge from 2.81 to 34.4 cfs. They cover the range in stage experienced except for the lower daily flows on January 14-18, February 2, 7-17 and April 8-16, 2011; and higher daily flows on June 13, 2011. The peak flow of 101 cfs occurred at 1000 on June 20, 2011 at a gage height of 4.37 ft with a shift of -0.37 ft.
Discharge.--	Shifting control method was used all year and shifts were distributed by time proration except for the peak event period when shifts were distributed using variable shift curve CANSWKCOV\$011B. Prorated shifts were applied directly and given full weight except for Measurements 286-287, which were side-by-side measurements and were discounted 2.08% and -1.78%, respectively, to the same -0.37 ft shift. Measurement 289 was discounted 6.54% for smoothing purposes onto the variable shift curve. The variable shift curve was initiated after measurement 286 and ended before measurement 288. The curve encompassed measurements 285-289 because they covered the range in stage (1.98 ft – 2.86 ft) for which the curve was being applied. For gage heights above 2.86 ft, the curve is not well defined.
Special Computations.--	Temperature and precipitation data from the DWR ARKLAJCO gage and La Junta Municipal Airport NOAA gage was utilized to analyze potential ice affect and unusual spikes respectively. Diversions from the Catlin Canal and Catlin at Crooked Arroyo were compared to CANSWKCO discharges for mass balance consideration and source of large varied flows.
Remarks.--	Record is good for the entire water year, except for periods of backwater caused by ice affect, which are estimated and considered poor. Computed flows for gage heights above 2.90 ft and the peak for the year are rated poor due to lack of rating definition. Station maintained and record developed by Garrett Markus.
Recommendations.--	Levels need to be run in WY12. All chisled benchmarks should be replaced with either a brass cap or concrete pin for improved accuracy during levels. Rating 7 needs to be updated to correct a negative shift trend.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07122400 CROOKED ARROYO NEAR SWINK, CO

RATING TABLE-- CANSWKCO07 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

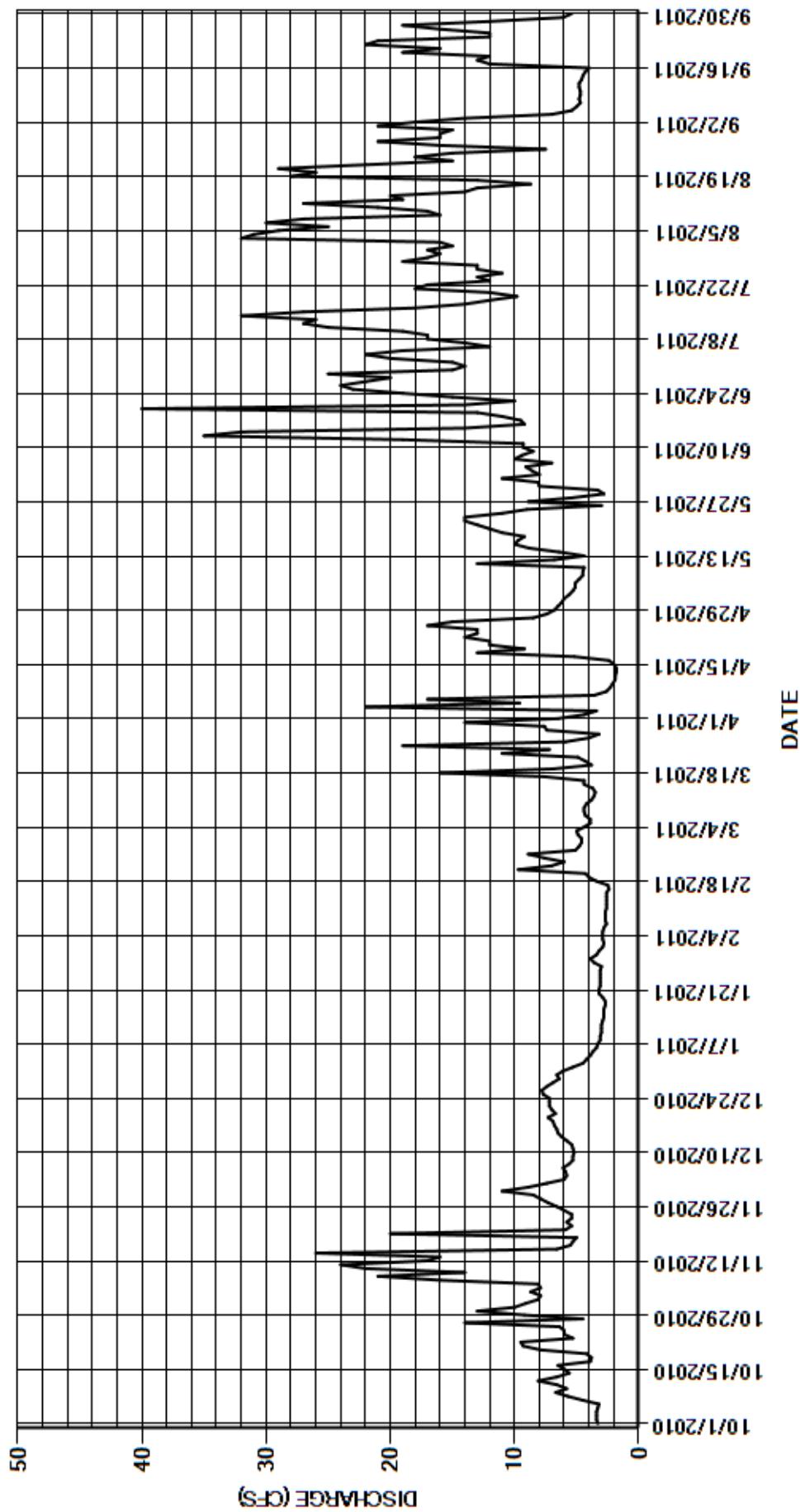
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.3	9.1	8.9	5.3	2.9	4.6	6.5	6.2	8.1	14	15	21
2	3.4	8.1	7.4	4.5	2.8	4.9	4.4	6.0	11	15	16	18
3	3.4	7.9	6.0	4.2	2.9	5.0	3.4	5.6	8.0	20	32	14
4	3.4	8.7	5.8	3.9	2.9	4.4	22	5.3	8.6	22	31	7.0
5	3.3	7.9	5.9	3.7	2.9	3.9	9.6	5.1	9.1	19	29	5.4
6	3.2	8.1	6.1	3.4	2.8	3.9	17	5.1	7.0	12	25	5.0
7	4.5	16	5.6	3.3	2.6	4.3	3.6	4.8	10	14	30	4.7
8	5.7	21	5.3	3.1	2.7	4.4	2.6	4.5	9.4	17	27	4.8
9	6.7	14	5.3	3.1	2.7	4.4	2.3	4.5	8.5	17	16	4.7
10	5.8	22	5.2	3.0	2.7	4.2	2.1	4.4	9.3	19	17	4.7
11	6.6	24	5.3	3.0	2.6	3.8	1.9	13	9.3	25	21	4.8
12	8.1	17	5.4	3.0	2.6	3.6	1.9	6.8	19	27	27	4.8
13	6.6	16	5.8	2.9	2.6	3.5	1.8	4.4	35	26	19	4.6
14	5.6	26	6.2	2.8	2.6	3.7	1.8	6.4	32	32	20	4.5
15	6.0	6.6	6.5	2.8	2.6	4.4	2.0	8.8	14	27	14	4.3
16	6.5	5.5	6.6	2.8	2.4	4.4	2.4	10	9.2	18	13	4.0
17	3.9	5.3	6.8	2.7	2.5	7.6	5.2	9.7	9.5	14	8.7	12
18	3.8	5.0	6.9	2.7	3.4	16	13	9.2	11	12	13	13
19	4.2	20	7.3	2.9	4.0	6.9	9.2	11	13	9.8	28	12
20	7.9	5.9	6.7	3.2	4.3	3.8	12	12	40	12	26	19
21	9.3	5.4	7.0	3.2	9.7	4.3	12	13	14	18	29	16
22	9.5	5.8	7.2	3.1	7.0	4.9	14	14	10	17	22	22
23	5.3	5.4	7.2	3.1	6.0	11	13	14	15	12	15	21
24	6.0	e5.4	7.2	3.1	7.6	7.2	13	11	19	13	18	12
25	6.0	e6.0	7.7	3.1	8.9	19	17	9.0	23	11	15	12
26	6.4	e6.6	7.8	3.1	5.1	5.9	15	3.0	24	13	7.5	16
27	14	e7.3	7.4	3.0	4.8	4.0	8.5	8.9	22	13	16	19
28	4.5	e7.9	6.9	3.6	4.6	3.2	7.4	5.4	20	19	21	12
29	9.2	e8.5	6.4	3.9	---	7.4	6.8	2.8	25	17	16	6.1
30	13	e11	6.6	3.4	---	7.6	6.5	3.3	15	16	16	5.4
31	10	---	6.1	3.2	---	14	---	8.0	---	17	15	---
TOTAL	195.1	323.4	202.5	102.1	111.2	190.2	237.9	235.2	468.0	537.8	618.2	313.8
MEAN	6.29	10.8	6.53	3.29	3.97	6.14	7.93	7.59	15.6	17.3	19.9	10.5
AC-FT	387	641	402	203	221	377	472	467	928	1070	1230	622
MAX	14	26	8.9	5.3	9.7	19	22	14	40	32	32	22
MIN	3.2	5.0	5.2	2.7	2.4	3.2	1.8	2.8	7.0	9.8	7.5	4.0
CAL YR	2010	TOTAL	5099.3	MEAN	14.0	MAX	48	MIN	3.2	AC-FT	10110	
WTR YR	2011	TOTAL	3535.4	MEAN	9.69	MAX	40	MIN	1.8	AC-FT	7010	

MAX DISCH: 101 CFS AT 10:00 ON JUN 20,2011 GH 4.37 FT SHIFT -0.37 FT

MAX GH: 4.37 FT AT 10:00 ON JUN 20,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07122400 CROOKED ARROYO NEAR SWINK, CO
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
07123000 ARKANSAS RIVER AT LA JUNTA
Water Year 2011

Location.--	Lat. 37°59'26", Long. 103°31'55", in SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 2, T.24 S., R.55 W., Otero County, Hydrologic Unit 11020005, on right bank at upstream side of bridge on State Highway 109 in La Junta, 450 ft upstream from King Arroyo.
Drainage Area and Period of Record.--	12,210 mi ² . Staff gage originally established by USGS in 1889, with sporadic data and various locations. Water stage recorder in use since Oct. 1933 at several locations also. Gage site in continuous use since then.
Equipment.--	Satellite-monitored data collection platform (high data rate Sutron Satlink 2 DCP) and Sutron Constant Flow Bubbler in 4 ft x 4 ft steel shelter. A wire-weight gage on the Hwy 109 Bridge serves as the primary reference gage. An air temperature sensor was installed on March 17, 2010. A radar water level sensor was installed on May 25, 2010. The data from the radar sensor were not used for this streamflow record. The 8210 platform was replaced with the Satlink 2 platform on July 28, 2011. No other changes were made this water year.
Hydrologic Conditions.--	The drainage basin which contributes to the gage encompasses approximately 12,210 square miles. Basin characteristics include elevation differences from Mt. Elbert at 14,433 ft to the gage at elevation 4,041 ft with vegetation ranging from alpine tundra to sparse pinon-juniper in the upper reaches and from irrigated farmland to rangeland in the lower reaches. The gage is located downstream from Pueblo Reservoir approximately 92 miles. Pueblo Reservoir regulates flows through the reservoir year round including the Winter Water Storage Program period of November 15 to March 15 when the gates are essentially closed and streamflow is stored for release during the irrigation season. Release of water from Pueblo Reservoir takes approximately 46 hours to reach the gage. Unregulated tributaries that contribute to the gage include Fountain Creek, St. Charles River, Huerfano River, Apishapa River, Timpas Creek, and Crooked Arroyo. Numerous irrigation diversion points exist above the gage. All of these factors influence streamflow at the gage. Mean annual precipitation for the basin is 16.87± inches. The heavy vegetation was removed and maintained on both banks up and downstream of the gage. No other observed hydrologic conditions changes in the basin this water year.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP and CFB logs as backup. Record is complete and reliable except for Dec. 31, 2010 - Jan. 14, 2011 and Feb. 2-12, 2011 when ice affected the stage-discharge relationship. There were six missing 15-minute CFB gage height values on July 28 when the Satlink 2 platform was installed. The missing values were replaced using surrounding good values and trend in gage height change without loss of accuracy.
Datum Corrections.--	Levels were last run on Oct. 4, 2007. No corrections were made.
Rating.--	A shifting sand channel is the primary control at low stages with bridge piers, abutments, lightly vegetated banks and islands contributing at medium flows and above. At high flows (flooding stage) river will flow out of bank on the north side approximately 150 to 200 feet upstream of the gage. Rating No. 42, implemented on May 13, 2009, was used during the entire water year. Thirty-one discharge measurements (Nos. 1164-1194), ranging in discharge from 24.3 to 1050 cfs, were made during the water year. They cover the range in stage experienced except for the lower daily flows of Oct 7 and 10, 2010 and higher daily flows of Jun 20-21, 2011. The peak flow of 1410 cfs occurred at 0715 on Jun 21, 2011 at a gage-height of 9.26 ft with a shift of 0.43 ft. It exceeded the stage of high flow measurement No. 1189 by 0.58 feet.
Discharge.--	Shifting channel control method used all year. Shifts were applied as defined by measurements and distributed by time and stage. Shifts were distributed by time (with consideration of high flow events) from 0000 Oct 1 2010 through 1200 June 2, 2011. From this point, the shift from Msmt No. 1182 was held to 0630 June 5, 2011 to transition on the variable shift curve. Two variable stage shift relationships were used the remainder of the water year: ARKLAJCOVS1107 and ARKLAJCOVS1108 are similar and are separated by shifts from Msmts 1187 and 1194. The remainder of the two variable shift curves are based on Msmts 1183-1194. The upper end of both curves is based on Msmt No. 1155 made June 10, 2010. ARKLAJCOVS1107 was used from 0645 June 5 to 0445 Sept 5 and 1030 Sept 17 to the end of the water year. ARKLAJCOVS1108 was used from 0500 Sept 5 to 1015 Sept 17. Water year 2011 measurements showed shifts ranging from -0.59 to +0.20 ft. Measurement Nos. 1173, 1183, 1187, 1188, and 1193 were discounted from 1.60%, -3.87%, -0.42%, -0.22%, and -1.83% respectively to fit the variable stage shift relationships.
Special Computations.--	Flows were estimated on ice affected days using ARKLAJCO temperature data and good partial day record and good record before and after periods of ice effect. A hydrograph was used and daily average flows were compared to upstream gage: Arkansas River near Rocky Ford. Rapid increases/decreases in gage height observed at the gage during the irrigation season can be due to the effects of Ft. Lyon Canal gate changes and sluice gate operations, both of which are within three miles upstream of the gage.
Remarks.--	The record is considered good due to the number of measurements made. Record during periods of ice-affected gage height should be considered poor. The peak was rated good considering the frequency of measurements surrounding it and the mild gage height flux from measurement to peak to measurement. The variable shift curve was applied during this period to help with accuracy of capturing peak events. Station maintained and record developed by Garrett Markus.
Recommendations.--	Survey levels should be ran to confirm benchmark relativity. All etched benchmarks should be replaced with a brass cap and redefined. The radar sensor and wire weight should be moved closer to the right hand bank so they are less likely to be affected by sand bars during low flow periods.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07123000 ARKANSAS RIVER AT LA JUNTA

RATING TABLE-- ARKLAJCO42 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

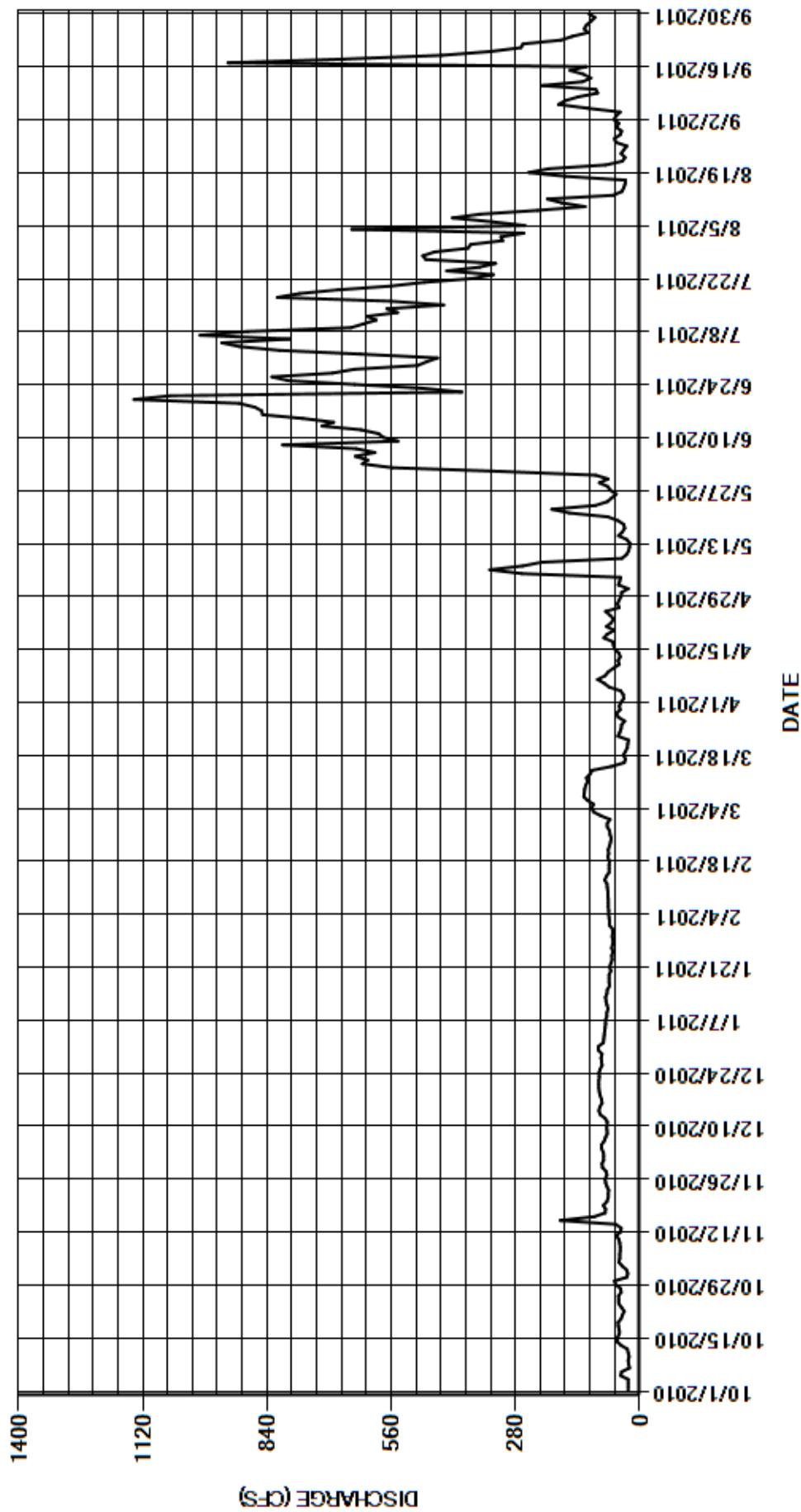
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	26	27	81	e82	68	67	42	26	313	456	309	47
2	26	30	81	e81	e68	88	36	48	558	630	313	58
3	26	40	82	e80	e69	104	37	45	625	812	261	53
4	26	47	86	e79	e70	109	43	43	613	902	649	44
5	43	45	86	e78	e70	104	69	266	641	942	259	117
6	41	45	80	e77	e71	117	80	338	597	789	333	183
7	23	44	77	e77	e71	126	95	264	639	991	422	168
8	25	44	73	e74	e71	125	78	221	805	884	360	139
9	26	45	74	e74	e72	124	71	40	545	651	230	95
10	24	47	74	e71	e72	122	59	30	578	623	123	99
11	26	53	73	e74	e73	117	46	25	589	594	176	220
12	28	43	78	e76	e74	120	49	23	628	615	208	129
13	42	42	89	e77	79	112	44	22	716	546	60	110
14	51	54	92	e74	75	107	47	29	690	570	40	127
15	50	179	90	73	69	64	56	48	760	442	36	157
16	46	102	85	68	69	35	59	39	850	561	33	120
17	46	78	86	69	69	32	61	34	852	817	32	928
18	48	77	89	69	68	37	81	36	868	767	167	667
19	49	82	91	69	72	32	73	49	903	680	250	446
20	42	74	92	65	70	28	57	72	1140	561	205	336
21	39	71	92	68	71	27	75	158	1060	485	77	268
22	35	71	92	65	68	25	64	198	401	376	39	263
23	41	70	91	62	66	49	59	100	491	330	33	178
24	47	74	92	63	64	45	67	73	643	435	42	152
25	47	77	89	60	67	42	77	63	793	361	36	117
26	48	78	85	63	68	41	46	53	829	325	29	125
27	42	74	86	61	73	34	50	66	692	482	54	120
28	43	76	87	60	73	48	46	72	643	489	57	110
29	54	84	85	62	---	53	42	91	501	463	44	101
30	57	85	93	61	---	44	41	71	480	387	41	115
31	29	---	e93	61	---	46	---	99	---	381	53	---
TOTAL	1196	1958	2644	2173	1970	2224	1750	2742	20443	18347	4971	5792
MEAN	38.6	65.3	85.3	70.1	70.4	71.7	58.3	88.5	681	592	160	193
AC-FT	2370	3880	5240	4310	3910	4410	3470	5440	40550	36390	9860	11490
MAX	57	179	93	82	79	126	95	338	1140	991	649	928
MIN	23	27	73	60	64	25	36	22	313	325	29	44
CAL YR	2010	TOTAL	74456	MEAN	204	MAX	1820	MIN	19	AC-FT	147700	
WTR YR	2011	TOTAL	66210	MEAN	181	MAX	1140	MIN	22	AC-FT	131300	

MAX DISCH: 1410 CFS AT 07:15 ON JUN 21,2011 GH 9.26 FT SHIFT 0.43 FT

MAX GH: 9.27 FT AT 10:30 ON SEP 17,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07123000 ARKANSAS RIVER AT LA JUNTA
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
HORSE CREEK AT HIGHWAY 194
Water Year 2011

Location.--	Lat. 38°05'06", Long. 103°21'12", in SE1/4,SW1/4, sec. 33, T.22S., R.53 W., Bent County, Hydrological Unit 11020008, on right bank 15 ft upstream from right end of box culverts on State Highway 194, 3.2 mi upstream from mouth, 3.4 mi downstream from Ft. Lyon Canal Aqueduct, and 7.5 mi west of Las Animas, Co.
Drainage Area and Period of Record.--	1403 sq.mi. Established and operated Oct. 19, 1979 to Sep. 30, 1993 by USGS. Operated and maintained by State of Colorado Oct. 1, 1993 to present.
Equipment.--	Sutron Satlink 2 high data rate satellite-monitored data collection platform (DCP) with a Sutron constant flow bubbler sensor (CFB) in a 4 ft x 4 ft steel shelter. Primary reference gage is a staff gage on the right side of the channel just upstream of the concrete weir control. A Texas Electronics Series 525 tipping bucket rain gage is operated at the site. Control is a compound 2-stage weir: Cipolletti weir for lower flows and rectangular broad crested weir for higher flows. The 8210 platform was replaced with the Satlink 2 platform on July 28, 2011. No other changes this water year.
Hydrologic Conditions.--	The Horse Creek watershed above the gage is approximately 1,420 sq miles and consists primarily of rangeland with native grasses and weeds dotted with the occasional cacti. Grazing along with irrigated and non-irrigated farming comprise the major land uses. Mean annual precipitation is 13.79 inches with soils moderately contributing to runoff. Streamflow exhibits seasonal variation with the majority of the natural flow resulting from high intensity – short duration summer thunderstorms. The Fort Lyon canal extends over the creek in a large diameter pipe approximately 3.4 miles above the gage and is capable of discharging canal water into the creek. The Fort Lyon augmentation station at Horse Creek (FLY AUG CO) is at the same location and will contribute to flows of 15 cfs to the gage during augmentation.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP and CFB logs as backup. Record is complete and reliable except for the following periods when the gage heights were affected by ice: January 1-2 and 11-12, 2011; and February 1-3 and 8-11, 2011. Missing data occurred on July 28, 2011 for 7 unit values during the replacement of the 8210 platform. Missing data was replaced using an observed gage height value and adjacent good data without loss of accuracy.
Datum Corrections.--	Levels were last performed on October 4, 2007. On Nov. 27, 2007, a short level loop was re-run from RM7 in order to verify the Cipolletti weir crest and the staff gage elevations.
Rating.--	The compound Cipolletti - rectangular 2-stage weir control was installed in April 2005. The stainless steel Cipolletti weir controls low flows up to a head of 1 foot or approximately 14.4 cfs. Medium flows are controlled by the rectangular second stage of the compound weir with flows up to approximately 137 cfs. The high flows are controlled by the box culverts under Highway 194 and bank vegetation. There is a fence and drop structure on Horse Creek on the downstream side of Hwy 194. Weeds and debris can collect on the fence and cause the gage control structure to become submerged. When visiting this gage, care needs to be taken to ensure that the downstream fence is clear of debris. Rating No. 8 was developed on Dec 28, 2011 and applied to the entire water year record. Rating No. 8 improves the average percent error at both the lower end and upper end of the rating curve. Fifteen discharge measurements (Nos. 307-321) were made during this water year, ranging in discharge and gage height from 2.79 (0.34 ft) to 7.51 cfs (0.63 ft). The peak discharge of 43 cfs occurred at 0630 on August 16, 2011 at a gage height of 1.46 ft with a shift of -0.06 ft.
Discharge.--	Shifting section control used. Shifts were distributed by time proration throughout the water year. Over 83% of the maximum gage heights this water year flowed through the more accurate Cipolletti control and all fifteen discharge measurements were also within the Cipolletti. Measurements showed shifts ranged from -0.06 to 0.04 ft. This shifting may be due to the upstream weir pool needing to be cleaned combined with depth measurement errors on the wading rod due to the creek's soft bottom. Measurement Nos. 315-316 and 317-318 were side-by-side measurements and were discounted appropriately to the same shift.
Special Computations.--	Ice affected gage heights were estimated using non affected adjacent gage height data and upstream hydrographs for validation. Ice affected days were determined using temperature data from the NOAA La Junta Airport gage approximately 8 miles to the west of the gage.
Remarks.--	Record is good except for periods of ice effect, which are estimated and poor. The peak gage height and discharge are rated good given a hydrographer visited the site four days prior to the peak event. Station maintained and record developed by Garrett Markus.
Recommendations.--	A level survey of weir should be completed and the weir pool should be cleaned. Material removed from the weir pool can be placed along the right bank adjacent to the weir to prevent bypass flows.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

HORSE CREEK AT HIGHWAY 194

RATING TABLE-- HRC194CO08 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

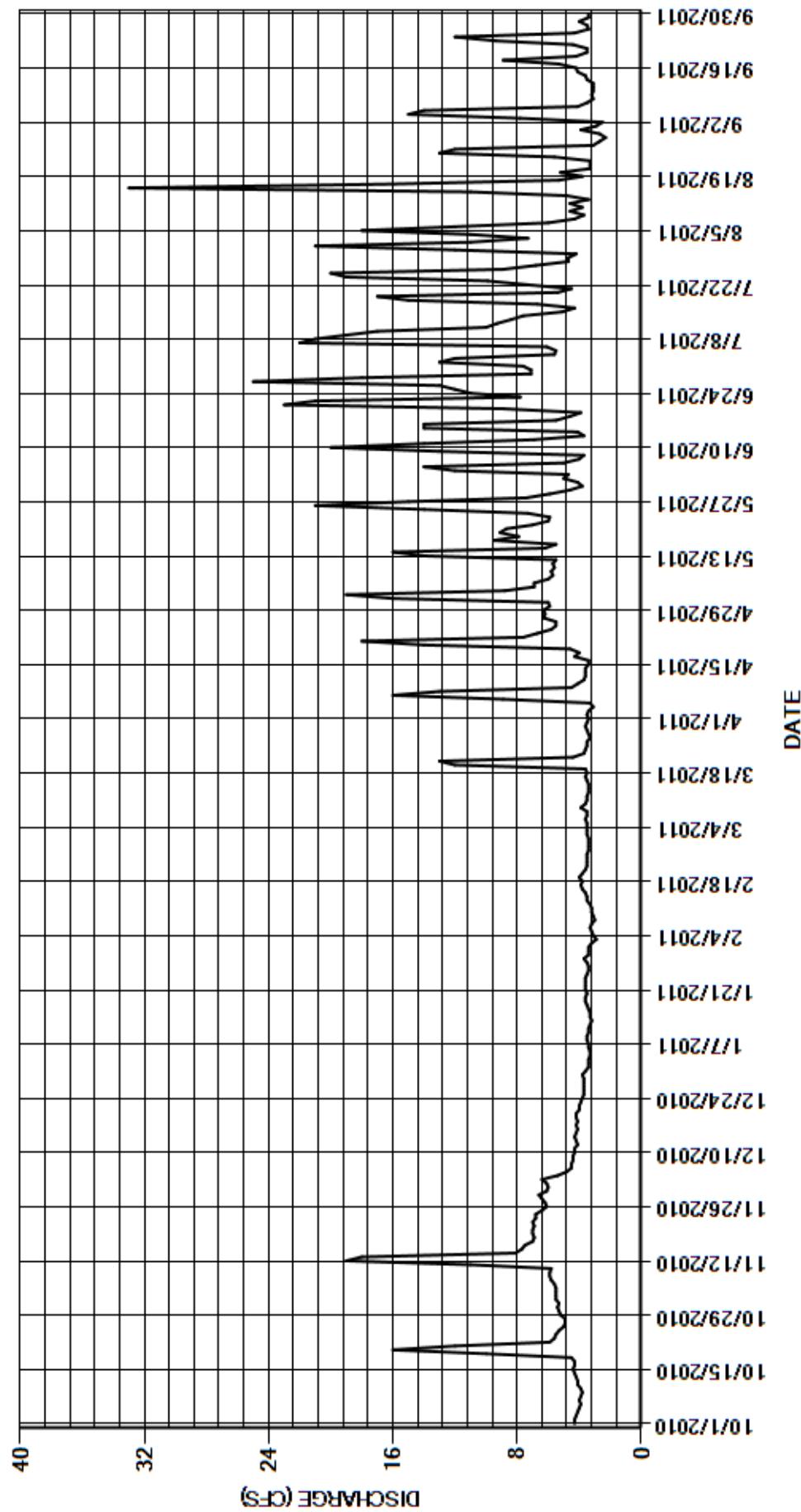
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.3	5.3	6.0	e3.4	e3.4	3.4	3.4	6.0	4.1	7.6	21	2.9
2	4.3	5.5	6.1	e3.4	e3.2	3.5	3.5	16	5.0	13	11	2.5
3	4.2	5.5	6.4	3.4	e2.9	3.5	3.4	19	4.7	12	7.3	7.8
4	4.1	5.5	5.4	3.3	3.1	3.5	3.1	8.8	12	5.6	11	15
5	4.0	5.5	4.8	3.3	3.2	3.5	3.3	6.9	14	5.5	18	14
6	3.9	5.6	4.5	3.4	3.3	3.6	8.9	6.9	5.0	6.1	12	4.1
7	4.0	5.8	4.5	3.4	3.2	3.5	16	6.0	4.0	22	6.0	3.5
8	3.9	5.9	4.4	3.5	e3.0	3.5	13	5.7	3.7	21	4.3	3.1
9	3.8	5.9	4.4	3.5	e3.1	3.9	4.5	5.8	13	19	3.7	3.2
10	3.9	5.8	4.3	3.4	e3.2	3.6	4.1	5.6	20	17	4.6	3.1
11	4.1	11	4.3	e3.4	e3.2	3.5	3.7	5.7	14	10	3.8	3.1
12	4.1	19	4.1	e3.3	3.3	3.5	3.6	5.5	6.9	9.3	4.6	3.1
13	4.2	18	4.2	3.2	3.5	3.4	3.6	14	3.7	8.4	3.4	3.5
14	4.3	8.1	4.3	3.3	3.5	3.4	3.6	16	4.1	7.6	4.8	3.6
15	4.4	7.7	4.2	3.3	3.6	3.4	3.4	6.2	14	5.1	11	4.1
16	4.3	7.5	4.1	3.4	3.8	3.5	3.4	5.5	14	4.3	33	4.2
17	4.3	7.0	4.2	3.5	3.9	3.6	4.3	9.5	5.5	6.7	16	5.3
18	4.5	6.9	4.1	3.6	3.8	3.5	4.0	7.9	4.6	15	5.3	8.9
19	10	7.0	4.2	3.6	4.0	3.6	4.6	9.1	3.9	17	3.8	4.2
20	16	7.0	4.2	3.5	3.8	12	14	8.7	8.9	5.4	5.2	3.5
21	12	6.9	4.0	3.6	3.6	13	18	7.0	23	4.5	3.3	3.5
22	5.9	7.0	4.0	3.6	3.5	4.4	7.6	6.0	21	7.3	3.3	4.4
23	5.6	6.8	3.9	3.6	3.5	3.7	6.7	5.9	7.8	9.9	3.3	9.4
24	5.5	6.8	3.8	3.6	3.5	3.6	5.8	7.3	11	19	5.6	12
25	5.3	6.4	3.7	3.5	3.5	3.5	5.5	14	12	20	13	4.3
26	5.0	6.1	3.7	3.4	3.4	3.5	5.5	21	13	8.9	12	3.4
27	4.9	6.2	3.7	3.4	3.4	3.3	6.3	15	25	6.8	3.1	3.5
28	4.9	6.4	3.7	3.5	3.4	3.4	6.2	7.4	18	4.7	2.7	4.0
29	5.2	6.6	3.7	3.7	---	3.5	6.3	5.9	7.1	4.7	2.3	3.4
30	5.3	6.1	3.8	3.4	---	3.6	5.9	4.6	7.1	4.2	2.7	3.4
31	5.4	---	3.6	3.4	---	3.5	---	3.8	---	12	3.9	---
TOTAL	165.6	220.8	134.3	106.8	95.8	127.9	185.2	272.7	310.1	319.6	245.0	154.0
MEAN	5.34	7.36	4.33	3.45	3.42	4.13	6.17	8.80	10.3	10.3	7.90	5.13
AC-FT	328	438	266	212	190	254	367	541	615	634	486	305
MAX	16	19	6.4	3.7	4.0	13	18	21	25	22	33	15
MIN	3.8	5.3	3.6	3.2	2.9	3.3	3.1	3.8	3.7	4.2	2.3	2.5
CAL YR	2010	TOTAL	3901.1	MEAN	10.7	MAX	69	MIN	3.1	AC-FT	7740	
WTR YR	2011	TOTAL	2337.8	MEAN	6.40	MAX	33	MIN	2.3	AC-FT	4640	

MAX DISCH: 43 CFS AT 06:30 ON AUG 16,2011 GH 1.46 FT SHIFT -0.06 FT

MAX GH: 1.46 FT AT 06:30 ON AUG 16,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

HORSE CREEK AT HIGHWAY 194
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
RATON CREEK ABOVE STARKVILLE, CO
Water Year 2011

Location.--	Lat. 37°07'35.5", Long. 104°31'24.8" in NW¼, NE¼, NE¼, Section 35,T33S, R64W, Las Animas County, 20 feet away from the creek on the left upstream side of bridge for County Road 18.3 approximately half a mile south of Interstate 25 exit 8 south of Trinidad.
Drainage Area and Period of Record.--	54.49 sq.mi.
Equipment.--	Sutron SatLink2 data collection platform (DCP) with High Data Rate (HDR) radio and shaft encoder. The data logger is housed inside a 4 ft x 4 ft x 8 ft metal shelter about 20 feet from the creek, while the shaft encoder is in a 20 in x 30 in metal "half" shelter atop an armored 18 inch corrugated metal pipe stilling well attached to the left wing wall on the upstream side of the bridge. A Texas Instruments tipping bucket rain gage is mounted on the antenna mast. The shaft encoder is set to an electric drop tape inside the half shelter and well. No changes this water year.
Hydrologic Conditions.--	The gage is situated in a valley at the town of Starkville approximately two miles above the Purgatoire at Trinidad gage. The gage is subject to flash flooding from the higher mountainous area above the gage with several smaller tributary streams. The channel is contained on the left side by railroad tracks set higher and a sheer wall several feet higher, the right side is contained by the county road for about a hundred feet and then the valley wall. Channel work done by Las Animas County as part of bridge repair changed the shape of the channel in 2010 and again in May 2011.
Gage-Height Record.--	Primary record is the fifteen minute satellite data with the DCP log data used for back-up purposes. Record is complete and reliable, except for the following periods: October 29, 30, November 12 - 18, 21, 22, 25 – December 31, 2010, January 1 – February 15, 21, 22, 27, 28, March 1, 2, 2011 when ice in the creek and/or well affected the stage-discharge relationship. The gage was isolated May 2 – 4 due to channel work.
Datum Corrections.--	No levels were run this year. Previous levels were run September 18, 2007. No corrections were needed.
Rating.--	The control at low flows up to 10 cfs is a gravel riffle in the creek channel. Control at medium to high stage includes the riverbanks and brush lining the edges of the channel as well as the bridge. The control for low to medium and high flows is now a gravel/cobble riffle that extends the full width of the bridge. Extreme high flows can go out of the channel on the right bank into an area upstream and extending approximately 30 feet south of the bridge and on the left bank 30 feet to the north which is at a slightly lower elevation than the gage. The extreme high flow would bypass the gage on the left side. Rating No. 4, dated December 1, 2010, was used for the entire water year. Rating No. 4 is well defined to about 40 cfs. Rating Number 04 was developed based on ten measurements including the high measurement of 40 cfs, as the result of channel work done for bridge repair. Eighteen discharge measurements (Nos. 123 – 140) were made during water year, with Measurements 135 – 140 being observations of zero flow. Measurements ranged in discharge from 0.00 to 0.78 cfs. They cover the range in stage experienced, except for the higher daily flows of December 18 – 27, 2010; Mar 5 – 10, 15, 16; 2011. The peak discharge of 27.0 cfs occurred at 1615 July 29, 2011 at a gage height of 3.89 ft with a shift of -0.23 ft. It exceeded Measurement No 127, made February 16, 2011 by 1.04 feet in stage.
Discharge.--	Shifting control method was used the entire water year. Shifts were applied as defined by measurements and distributed by time from 0000 October 1, 2010 to 1345 May 4, 2011. A shift curve RACRSTCO11_1 was developed and used from 1400 May 4 to 2345 September 30, 2011. Open water measurements indicated shifts varying from -0.23 to 0.00 ft. All measurements were made in open water and given full weight.
Special Computations.--	Channel work under the bridge immediately above the gage was minimal this year having a limited effect on the gage, with the exception of the period from May 2 – 4 when the gage was "buried" and isolated. This was corrected on May 4 when channel work was done. The changed shape of the channel effectively raised the PZF of the gage to 2.80 feet as reflected in Rating 04. This gage will often go dry during the water year causing shifts often to be disconnected from one measurement to the next. Temperature record from the SatLink 2 internal sensor and measurements 124 – 128 were used for estimating flows during periods of ice effect. Periods of zero flow were verified by observation visits and Msmt Nos. 135 – 140. The peak of July 29 and the flow of August 11 were both calculated using shift curve RACRSTCO11_1, which used Measurement No. 148 made March 29, 2012 to verify little or no channel change.
Remarks.--	The record should be considered fair to poor due to the quality of the measurements and the small discharges measured. Periods of ice effect should be considered poor. The peak should be considered poor due to the lack of reference measurements made to better define the upper end of the rating. Station maintained and record developed by Anthony D. Gutierrez.
Recommendations.--	Levels need to be run in Water Year 2012.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

RATON CREEK ABOVE STARKVILLE, CO

RATING TABLE-- RACRSTCO04 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.39	e0.34	e0.43	e0.29	e0.52	0.62	0.84	0.02	0.00	0.00	0.00
2	0.00	0.41	e0.35	e0.43	e0.28	e0.59	0.58	e0.75	0.02	0.00	0.00	0.00
3	0.00	0.41	0.39	e0.42	e0.30	0.65	0.52	e0.70	0.00	0.00	0.00	0.00
4	0.00	0.41	0.28	e0.34	e0.31	0.77	0.73	e0.65	0.00	0.00	0.00	0.00
5	0.00	0.43	e0.25	e0.35	e0.31	0.88	0.71	0.43	0.00	0.00	0.00	0.00
6	0.00	0.41	e0.30	e0.32	e0.30	0.87	0.68	0.40	0.00	0.00	0.00	0.00
7	0.00	0.35	0.32	e0.30	e0.26	0.93	0.63	0.30	0.00	0.00	0.00	0.00
8	0.00	0.40	e0.33	e0.33	e0.26	0.93	0.62	0.38	0.00	0.00	0.00	0.00
9	0.00	0.41	e0.34	e0.34	e0.24	0.82	0.57	0.41	0.00	0.00	0.00	0.00
10	0.00	0.42	0.41	e0.35	e0.24	0.80	0.56	0.37	0.00	0.00	0.00	0.00
11	0.00	0.41	0.47	e0.35	e0.26	0.66	0.64	0.32	0.00	0.00	0.69	0.00
12	0.00	e0.40	e0.50	e0.35	e0.26	0.65	0.72	0.40	0.00	0.00	0.00	0.00
13	0.10	e0.39	e0.52	e0.36	e0.55	0.72	0.72	0.35	0.00	0.00	0.00	0.00
14	0.10	e0.41	e0.55	e0.40	e0.58	0.78	0.72	0.29	0.00	0.00	0.00	0.00
15	0.04	e0.41	e0.56	e0.39	e0.60	0.80	0.72	0.41	0.00	0.00	0.00	0.00
16	0.03	e0.42	e0.60	e0.40	0.59	0.83	0.79	0.35	0.00	0.00	0.00	0.00
17	0.00	e0.42	e0.78	e0.41	0.37	0.71	0.86	0.28	0.00	0.00	0.00	0.00
18	0.06	e0.41	e0.80	e0.44	0.18	0.66	0.79	0.28	0.00	0.00	0.00	0.00
19	0.17	0.44	1.1	e0.45	0.10	0.64	0.75	0.28	0.00	0.00	0.00	0.00
20	0.25	0.35	1.3	e0.44	0.31	0.59	0.70	0.28	0.00	0.00	0.00	0.00
21	0.27	0.34	e0.95	e0.45	e0.22	0.63	0.72	0.32	0.00	0.04	0.00	0.00
22	0.41	0.42	e0.95	e0.48	e0.21	0.64	0.67	0.39	0.00	0.00	0.00	0.00
23	0.35	e0.42	1.2	e0.47	0.24	0.67	0.64	0.25	0.00	0.00	0.00	0.00
24	0.17	e0.42	1.4	e0.49	0.33	0.71	0.71	0.24	0.00	0.00	0.00	0.00
25	0.21	e0.42	e1.0	e0.51	0.28	0.72	0.72	0.27	0.00	0.00	0.00	0.00
26	0.26	e0.41	e0.90	e0.48	0.28	0.69	0.72	0.18	0.00	0.00	0.00	0.00
27	0.35	e0.40	e0.80	e0.40	e0.39	0.70	0.74	0.16	0.00	0.00	0.00	0.00
28	0.33	e0.39	e0.70	e0.35	e0.42	0.64	0.76	0.14	0.00	0.00	0.00	0.00
29	e0.28	e0.35	e0.65	e0.36	---	0.60	0.71	0.11	0.00	0.69	0.00	0.00
30	e0.27	e0.35	e0.60	e0.30	---	0.61	0.69	0.05	0.00	0.00	0.00	0.00
31	0.28	---	e0.50	e0.31	---	0.68	---	0.03	---	0.00	0.00	---
TOTAL	3.93	12.02	20.14	12.20	8.96	22.09	20.71	10.61	0.04	0.73	0.69	0.00
MEAN	0.13	0.40	0.65	0.39	0.32	0.71	0.69	0.34	0.001	0.024	0.022	0.000
AC-FT	7.8	24	40	24	18	44	41	21	.08	1.4	1.4	0
MAX	0.41	0.44	1.4	0.51	0.60	0.93	0.86	0.84	0.02	0.69	0.69	0.00
MIN	0.00	0.34	0.25	0.30	0.10	0.52	0.52	0.03	0.00	0.00	0.00	0.00

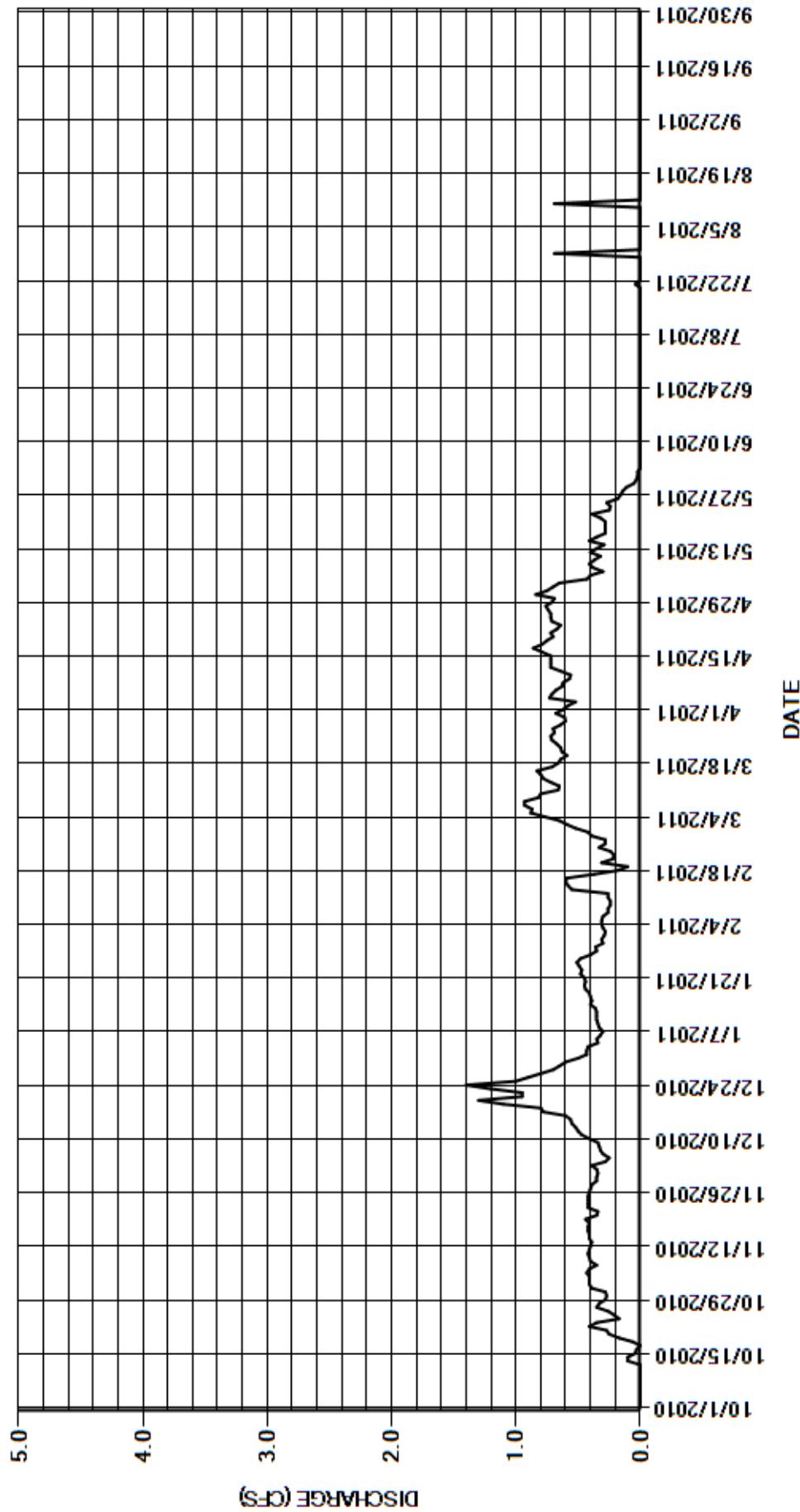
CAL YR	2010	TOTAL	828.42	MEAN	2.27	MAX	54	MIN	0.00	AC-FT	1640
WTR YR	2011	TOTAL	112.12	MEAN	0.31	MAX	1.4	MIN	0.00	AC-FT	222

MAX DISCH: 27 CFS AT 16:15 ON JUL 29,2011 GH 3.89 FT SHIFT -0.23 FT

MAX GH: 3.89 FT AT 16:15 ON JUL 29,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

RATON CREEK ABOVE STARKVILLE, CO
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
07124500 PURGATOIRE RIVER AT TRINIDAD
Water Year 2011

Location.--	Lat. 37°10'21", Long. 104°30'27", in NW 1/4 SE 1/4 sec. 13, T.33 S., R.64 W., Las Animas County, in city of Trinidad, on left bank. This is at the west end of the Commercial Street Bridge 20 feet upstream.
Drainage Area and Period of Record.--	A drainage area of 795 mi ² , was furnished by the US Army Corp of Engineers. The gage was first established May 1, 1896 (discharge estimated Oct. 1, 1895 to Apr. 30 1896) and operated till July 31, 1899 (discharge estimated through Sept. 30, 1899). It was re-established Aug. 25, 1905 and operated till Nov. 30, 1912. Water-stage recorders were placed at various sites from the current site to approximately one mile upstream from Nov 11, 1921 to the present. In December 1988 a data collection platform with satellite radio was installed and began transmitting data, this has been in operation to the present.
Equipment.--	Sutron 8210 High Data Rate DCP (satellite monitored data collection platform) connected to a Sutron Constant Flow Accubar Bubble Gage with Recorder (CFB) inside a 4 ft x 4 ft steel shelter on the left bank above the main channel. The CFB is connected to an orifice line inside a 1.5-inch galvanized pipe, which is anchored to the bank extending down and into the channel. The primary reference is a wire weight gage on the Commercial Street Bridge immediately downstream and in line with the orifice line and staff gage set in the streambed near the orifice. A Texas Electronics Series 525 rainfall sensor is also monitored by the DCP. No changes were made this year.
Hydrologic Conditions.--	The gage is located in the city of Trinidad approximately 3.5 miles downstream of the Trinidad Lake Reservoir and 2.65 miles downstream from the confluence with Raton Creek. It is on a fairly straight section of channel above and below the gage at an elevation of 5992 feet above MSL. The left side of the channel consists of gravel and small cobble at the orifice pool with the right side having fairly heavy vegetation consisting of grass to trees above and below the bridge. The regulation of Trinidad reservoir greatly influences the flow at the gage in town, while Raton Creek is subject to flash flooding. A small amount of irrigation is above the gage as well as the intake pipes for the city of Trinidad water supply. Urban runoff can affect the gage.
Gage-Height Record.--	Primary record is the 15-minute transmitted data with DCP and CFB logs as backup. Record is complete and reliable, except for the following periods: Nov 24 - 26; Dec 1 - 6, 8, 12, 13, 16 - 31, 2010; Jan 1 - 16, 20 - 31; Feb 1 - 16; Mar 1, 2, 6 - 11, 2011 when ice at or near the gage affected the gage height. Mar 28 - Apr 7 and Apr 17 - 21, 2011 when beaver dams were constructed 20 - 30 feet below the gage. Missing data on April 5 and 6 was supplied from the DCP backup.
Datum Corrections.--	No levels were run this water year. Levels were last run June 21, 2007. No corrections needed.
Rating.--	The river channel consists of gravel to small cobble from the reservoir down to a diversion dam 500 feet below the gage. The control for low flows is a gravel riffle below the gage under the bridge. Medium flows of up to 400 - 500 cfs are controlled by the channel, with dense vegetation on either side, or the center pier of the bridge. High flows are confined on the right bank by a stone and masonry wall which changes to a three foot high "river walk" wall on the right across from the gage and under the bridge and on the left bank by a gunite and rock wall up to the bridge to an elevation of ~11 feet (9000 cfs by USGS extension). Discharge of up to 9000 cfs can be contained under the Commercial Street Bridge, with higher flow coming out of the left bank and flooding the area immediately next to the river including the railroad tracks less than 40 feet from the river. Rating 28 was used the entire water year. Eighteen measurements (Nos. 1291 - 1308) made during the water year ranged from 0.86 to 111 cfs. They cover the range in stage except for the lower daily flows on Nov 24, 25 and the higher daily flows of Nov 10, 11, 2010, May 10 - 19, June 1, 8, 9, 15, 16, 30, Jul 6, 7, 12, 30, 31, and Aug 6, 7, 2011. The peak discharge of 231 cfs occurred at 1645 on July 29, 2011 at a gage height of 2.79 ft with a shift of -0.07 ft. It exceeded measurement No. 1303 made June 29, 2011 at 0.52 feet in stage. The peak discharge of July 29, 2010 was the result of 0.81 inches of rain fall that started on July 27, with 0.20 inches starting two hours before the peak.
Discharge.--	Shifting control method was used all year. Shifts were applied as defined by measurements and were distributed by time and event for the period from October 1, 2010 - 1415 March 23, 2011, 1545 May 23-1445 Jun 17, and from 1445 September 29 to end of the water year. Two shift curves were used PURTRICOVSC11A from 1430 Mar 23 - 1530 May 23 and PURTRICOVSC11B from 1500 June 17 - 1430 Sep 29, 2011. All measurements were made in open channel and were given full weight with the exception of Nos. 1298 and 1304 - 1306, which were discounted from -9% to +4% for smoothing purposes. Measurements 1293 - 1296 were made during periods of ice-affected gage heights. Measurements 1298 and 1299 were made immediately after removal of the beaver dams. Measurements this year showed shifts ranging from -0.15 feet to -0.06 feet.
Special Computations.--	Discharge during periods of ice were estimated using measurements 1293 - 1296, a hydrograph with temperature data from the Trinidad Airport and hydrograph from the Purgatoire River below Trinidad Reservoir. Discharge data from the Purgatoire River below Trinidad were used to help estimate for the periods of "beaver dam" effect.
Remarks.--	Record is considered to be good during periods of open channel and fair to poor during periods of ice affected gage height record and beaver dams. Winter releases from Trinidad Reservoir often help reduce the amount of ice in the channel. Station maintained and record developed by Anthony D. Gutierrez PS/ET II.
Recommendations.--	Shifts have continued to be negative from Water Year 2008, possibly due to the I-25 bridge construction upstream of the gage, which has at times worked in the river. The consistency of measured shifts from March 2008 to present indicates a modification to Rating 28 is needed. Any changes to the rating should not be done until the highway construction is completed.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07124500 PURGATOIRE RIVER AT TRINIDAD

RATING TABLE-- PURTRICO28 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

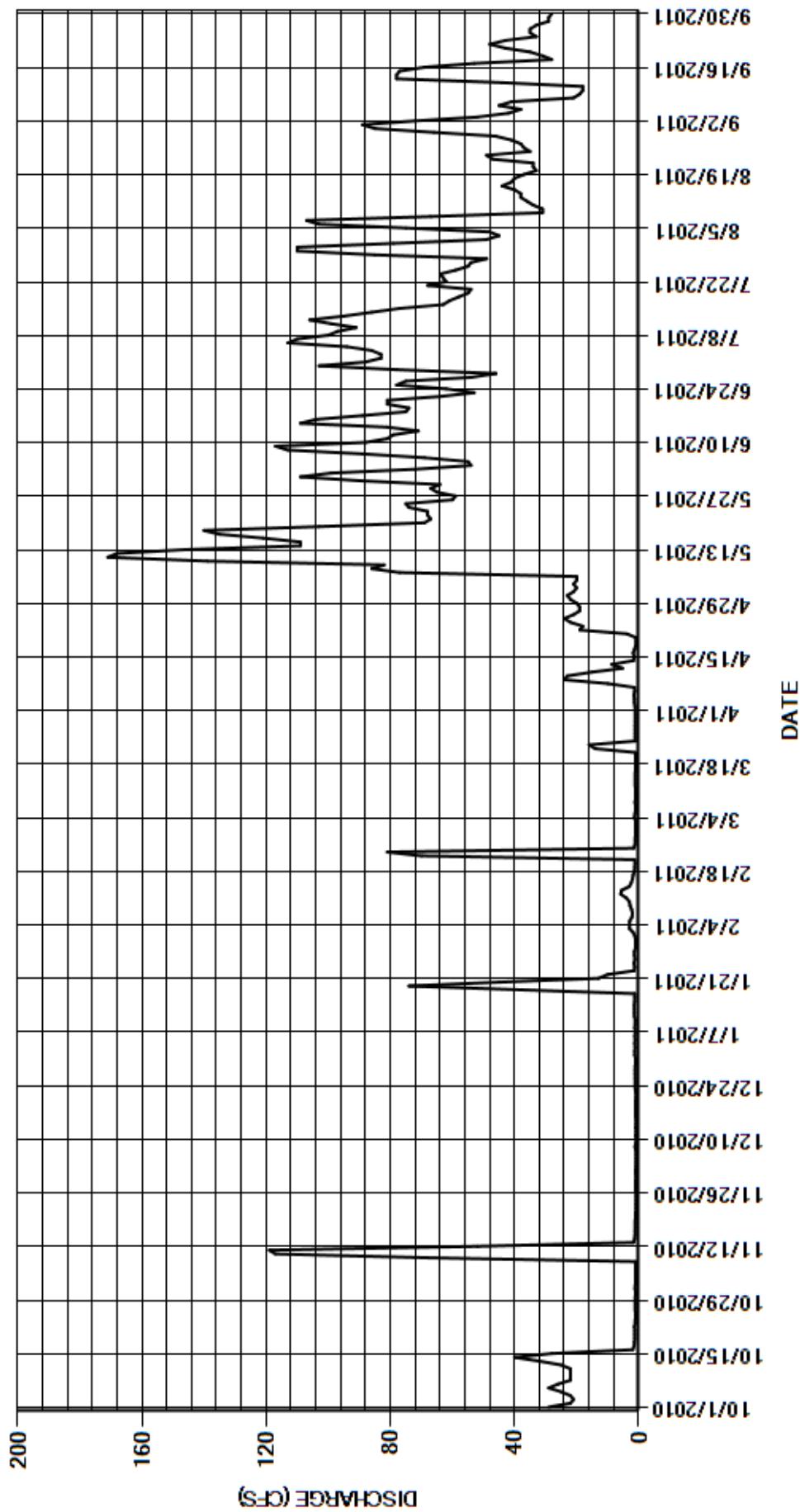
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	29	1.2	e1.0	e1.3	e1.2	e0.97	e1.2	23	109	88	79	89
2	22	1.1	e1.0	e1.2	e1.8	e1.0	e1.2	21	99	83	49	72
3	21	1.0	e0.95	e1.2	e3.0	0.98	e1.4	20	72	83	45	52
4	22	1.1	e0.90	e1.2	e3.0	1.4	e1.4	21	54	86	48	42
5	25	0.99	e0.90	e1.2	e2.9	1.2	e1.6	20	55	94	75	38
6	29	1.1	e0.87	e1.2	e2.2	e1.0	e1.3	20	69	113	103	45
7	26	0.99	0.92	e1.1	e2.0	e1.0	e1.4	77	89	110	107	41
8	22	1.0	e1.2	e1.2	e2.3	e1.2	10	86	113	100	67	21
9	22	68	0.93	e1.2	e2.8	e1.0	24	82	117	97	31	19
10	22	117	0.94	e1.1	e3.0	e1.0	23	139	88	91	31	18
11	22	119	1.0	e1.4	e4.0	e1.0	15	171	81	99	34	18
12	25	52	e0.90	e1.4	e5.8	1.1	5.2	168	79	106	36	44
13	32	1.7	e1.0	e1.4	e5.5	1.1	8.7	146	71	95	38	78
14	40	1.3	0.94	e1.4	e3.0	1.1	1.7	109	81	86	38	78
15	28	1.2	0.94	e1.3	e2.4	1.1	1.5	109	109	77	40	77
16	1.9	1.2	e1.0	e1.2	e2.0	1.1	1.8	121	104	63	44	69
17	1.5	1.1	e1.0	1.3	1.8	1.0	e1.3	135	89	61	41	53
18	1.4	1.1	e1.0	38	1.4	1.1	e0.95	140	75	58	40	28
19	1.3	1.1	e1.0	74	1.3	0.99	e0.85	103	74	55	37	31
20	1.3	0.99	e1.0	e45	1.2	1.0	e0.90	69	81	54	33	35
21	1.3	0.96	e0.94	e13	1.3	1.1	e3.8	67	81	68	34	43
22	1.4	0.92	e0.95	e10	70	14	19	68	64	62	34	48
23	1.1	0.97	e1.1	e1.5	81	16	18	68	53	63	47	43
24	1.1	e0.85	e1.1	e1.3	1.6	1.1	22	74	62	64	49	33
25	1.0	e0.85	e1.1	e1.6	1.2	1.2	24	75	78	59	35	35
26	1.1	e0.90	e1.2	e1.2	1.1	1.2	21	60	75	55	37	35
27	1.1	1.1	e1.2	e1.4	1.1	1.2	19	59	54	54	38	33
28	1.1	1.0	e1.2	e1.4	1.0	e1.2	19	65	46	49	41	29
29	1.1	1.0	e1.2	e1.0	---	e1.1	20	67	78	85	46	29
30	1.1	e0.95	e1.0	e1.0	---	e1.1	22	64	103	110	66	28
31	1.0	---	e1.0	e1.0	---	e1.1	---	90	---	110	85	---
TOTAL	406.8	383.67	31.38	212.7	210.9	61.64	292.20	2537	2403	2478	1528	1304
MEAN	13.1	12.8	1.01	6.86	7.53	1.99	9.74	81.8	80.1	79.9	49.3	43.5
AC-FT	807	761	62	422	418	122	580	5030	4770	4920	3030	2590
MAX	40	119	1.2	74	81	16	24	171	117	113	107	89
MIN	1.0	0.85	0.87	1.0	1.0	0.97	0.85	20	46	49	31	18
CAL YR	2010	TOTAL	29103.90	MEAN	79.7	MAX	563	MIN	0.70	AC-FT	57730	
WTR YR	2011	TOTAL	11849.29	MEAN	32.5	MAX	171	MIN	0.85	AC-FT	23500	

MAX DISCH: 231 CFS AT 16:45 ON JUL 29,2011 GH 2.79 FT SHIFT -0.07 FT

MAX GH: 2.79 FT AT 16:45 ON JUL 29,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07124500 PURGATOIRE RIVER AT TRINIDAD
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
07126500 PURGATOIRE RIVER AT NINEMILE DAM NEAR HIGBEE
Water Year 2011

Location.--	Lat. 37°42'53", Long. 103°30'38", in NW $\frac{1}{4}$ sec. 7, T.27 S., R.54 W., Otero County, Hydrologic Unit 11020010, on left bank at Ninemile Dam, 4 mi southwest of Higbee, and 5.5 mi upstream from Smith Canyon. Prior to Apr. 21, 1978 gage located 850 ft, upstream.
Drainage Area and Period of Record.--	2,752 mi ² .
Equipment.--	Sutron Constant Flow Bubbler water level sensor and satellite-monitored data collection platform (Sutron Satlink 2 DCP) in a 4 ft by 4 ft steel shelter. The primary gage is an outside drop tape from a reference point on a steel "I" beam on the wall face between Ninemile Dam and the Ninemile Canal headgate. Control is the Ninemile Dam. The 8210 platform was replaced by the Satlink 2 on July 29, 2011 and the orifice tube 'muffler' was replaced with an orifice tube 'end cap' on August 17, 2011. No other changes were made.
Hydrologic Conditions.--	Characteristics within the basin include uplands and hills forested with pine and juniper trees. Rolling short-grass prairie lies between the uplands and the canyons. Livestock grazing exists in the watershed. Rock cliffs are exposed along the 400- to 500- foot deep Purgatoire River canyon, and riparian vegetation grows along the bottom of incised reaches of the major tributaries near their confluence with the Purgatoire River. The months of November through March tend to produce little runoff because precipitation is mainly snow. Sublimation and slow melting remove water from the snowpack during warm periods of the winter. These processes might increase soil moisture but they also decrease the volume of surface water. Precipitation from April through October generally is in the form of snow that melts rapidly or high intensity-short duration rainfall, which produces the vast majority of the streamflow in the tributaries. Snowmelt from the mountains generally produces high flow in the Purgatoire River during the months May through June and storm runoff also generates streamflow. The Purgatoire River will generally convey the most streamflow in August. Typically, the increased streamflows in August were a result of mountain snowmelt stored in upstream reservoirs that was subsequently released for downstream irrigation needs. The August increased streamflows also may be a result of convective storms that commonly occur during the late July through August summer monsoon. The influence of urbanization and over grazing provides the largest affect to the runoff regime.
Gage-Height Record.--	Primary record is 15-minute satellite-monitored constant flow bubbler data with DCP log backup. Record is complete and reliable, except for the following periods: July 29, 2011 there were four unit values of missing satellite data during the installation of the Satlink 2. Given the short time period and gage height stability, these data were filled in from adjacent data without loss of accuracy. Primary stage sensor calibration to reference gage was supported by 28 site visits this water year, 14 of which were physical measurements.
Datum Corrections.--	Levels were last run Aug 22, 2008.
Rating.--	The control is the Ninemile Canal diversion dam which is constructed of wood timbers. Data for the stage-discharge relationship at this location is based on stage data collected on the upstream side of the diversion dam and discharge measurements made below the dam. Observations of zero flow past the dam are corroborated by measurements in the channel below the dam. Upstream from the dam, water will pond in bedrock pockets and holes. At low to medium flows, debris will collect along the dam and will clear at higher flows, thus changing the shift. Rating No.17 was developed on October 5, 1998 and was used the entire water year. Rating No. 17 is well defined to about 500 cfs. Fourteen discharge measurements (Nos. 1023-1036) were made ranging in discharge from 0 to 11.3 cfs. WY2011 measurements covered the range in stage experienced except for the higher daily flows of October 30 and November 1, 2010; February 21 and 25; June 20-22; July 5-6, 8-9, and 31 thru August 9; August 18, 25, and 30 thru September 2; and September 15 of 2011. The instantaneous peak flow of 1720 cfs occurred at 1845 on June 20, 2011 at a gage height of 4.77 ft with a shift of 0.04 ft. It exceeded the stage of measurement No. 1033, made July 6, 2011, by 1.72 feet.
Discharge.--	Shifting control method was used for the entire water year. Shifts were distributed by the variable shift curve PURNINCOVS01B except for the period between March 30 - June 7, 2011 which were distributed via event due to excessive trash on dam. To transition from the variable shift curve to event proration (visa versa), time proration was used during periods of zero flow; thus flows were not affected by this transition. Open water measurements showed shifts ranging from -0.12 to -0.01 feet. All measurements were given full weight and applied directly, except Msmt No. 1024 was discounted -7% to smooth shift distribution. Stage related shift changes were as larger runoff events occurred at the gage reflecting scour of the gage pool above the control and migration of shifts to the left. Shifts are seen to migrate back to the right as the gage pool fills. Shifts computed from observations of zero flow were applied to periods of low or no flow. In several cases debris on the dam resulted in large negative shifts.
Special Computations.--	Flows during periods of ice effect were estimated using air temperature data from Division of Water Resources ARKLAJCO temperature gage located approximately 19.05 miles north from the gage. It was concluded there was a single ice effect day (January 24, 2011) during the water year.
Remarks.--	

Record fair, except during periods flows over 500 cfs, which should be considered poor. The record for total flow in the river at this location is computed by adding Ninemile Canal flows to this record. Station maintained and record developed by Garrett Markus.

- Recommendations.--
- High flows have not been measured at or near the gage due to a lack of facilities. Recommend installation of a bank operated cableway.
 - Periods of trickle flows can occur when water elevation is below Constant Flow Bubbler orifice line. Recommend that orifice conduit and line be lowered to accomodate these circumstances. Run levels in WY2012.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

07126500 PURGATOIRE RIVER AT NINEMILE DAM NEAR HIGBEE

RATING TABLE-- PURNINCO17 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

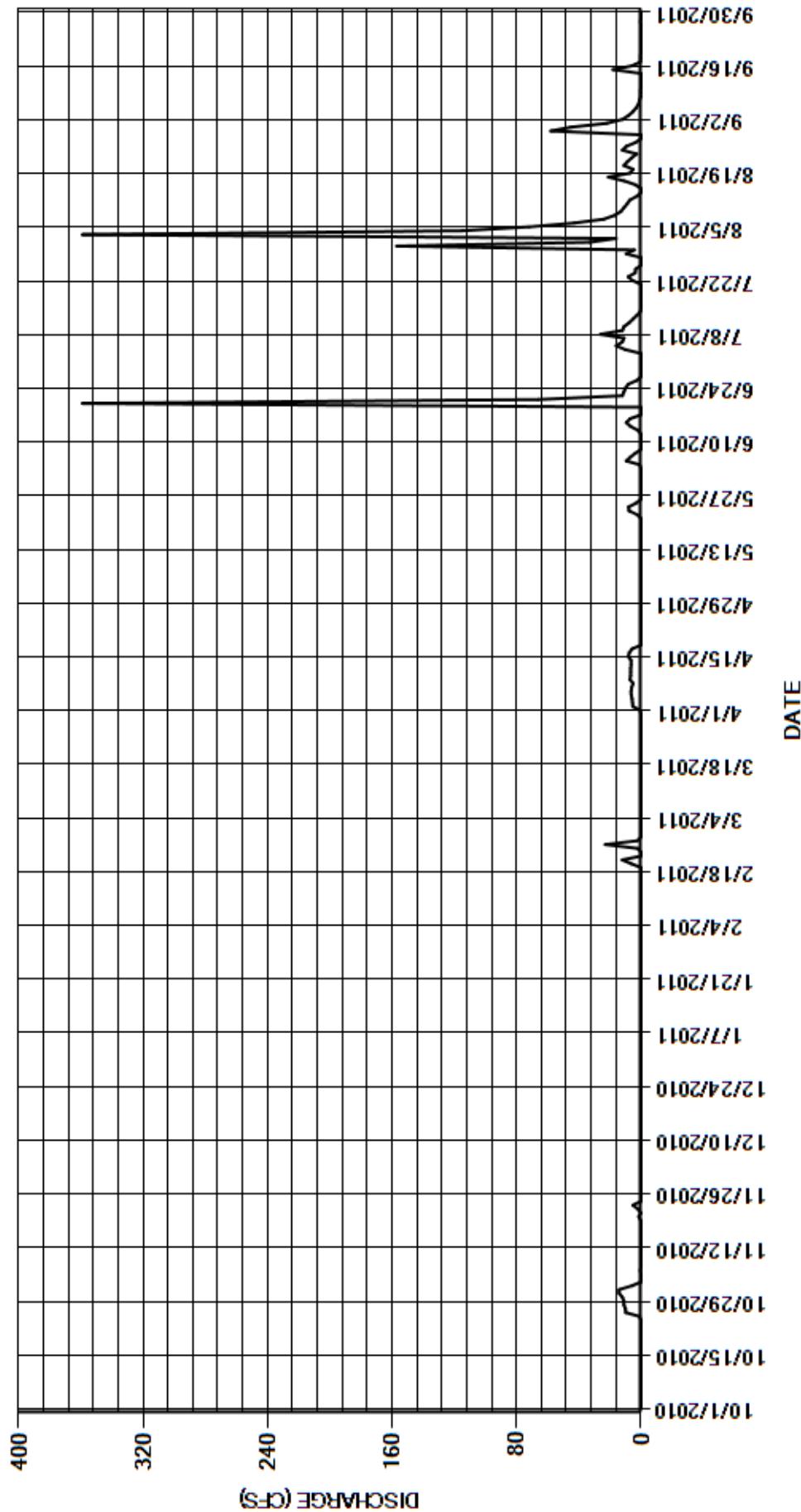
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	14	0.00	0.00	0.00	0.00	0.56	0.00	0.00	0.00	33	22
2	0.00	5.8	0.00	0.00	0.00	0.00	5.3	0.00	0.00	0.00	16	12
3	0.00	0.00	0.00	0.00	0.00	0.00	5.5	0.00	0.00	0.00	359	8.2
4	0.00	0.00	0.00	0.00	0.00	0.00	5.8	0.00	0.84	10	115	5.3
5	0.00	0.05	0.00	0.00	0.00	0.00	6.3	0.00	9.5	16	72	3.2
6	0.00	0.35	0.00	0.00	0.00	0.00	6.4	0.00	6.8	12	43	1.6
7	0.00	0.00	0.00	0.00	0.00	0.00	6.0	0.00	3.7	11	24	0.97
8	0.00	0.00	0.00	0.00	0.00	0.00	5.1	0.00	0.00	26	17	0.23
9	0.00	0.18	0.00	0.00	0.00	0.00	7.1	0.00	0.00	12	13	0.15
10	0.00	0.00	0.00	0.00	0.00	0.00	6.7	0.00	0.00	11	11	0.13
11	0.00	0.00	0.00	0.00	0.00	0.00	6.6	0.00	0.00	7.7	8.9	0.08
12	0.00	0.00	0.00	0.00	0.00	0.00	6.6	0.00	0.00	5.1	7.3	0.13
13	0.00	0.00	0.00	0.00	0.00	0.00	6.4	0.00	2.1	2.5	2.6	0.12
14	0.00	0.00	0.00	0.00	0.00	0.00	6.4	0.00	6.7	0.28	0.00	0.16
15	0.00	0.00	0.00	0.00	0.00	0.00	8.1	0.00	9.5	0.00	0.08	18
16	0.00	0.00	0.00	0.00	0.00	0.00	7.6	0.00	7.0	0.00	3.7	5.7
17	0.00	0.00	0.00	0.00	0.00	0.00	5.8	0.00	0.00	0.00	11	0.47
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21	0.16
19	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.1	0.16
20	0.00	1.5	0.00	0.00	6.2	0.00	0.00	0.00	359	0.00	5.0	0.11
21	0.00	0.02	0.00	0.00	12	0.00	0.00	0.00	66	0.00	11	0.04
22	0.00	2.1	0.00	0.00	0.00	0.00	0.00	2.5	12	5.4	8.8	0.13
23	0.00	5.2	0.00	0.00	0.00	0.00	0.00	7.7	11	8.3	6.0	0.07
24	0.00	0.00	0.00	e0.00	2.1	0.00	0.00	8.0	10	3.8	2.8	0.06
25	0.94	0.00	0.00	0.00	23	0.00	0.00	3.2	8.2	3.5	12	0.07
26	9.8	0.00	0.00	0.00	2.3	0.00	0.00	0.00	2.6	0.00	9.5	0.11
27	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.5	0.16
28	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.14
29	11	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	9.5	0.10
30	12	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	4.3	58	0.00
31	14	---	0.00	0.00	---	0.00	---	0.00	---	157	45	---
TOTAL	68.74	29.35	0.00	0.00	45.60	0.00	102.26	21.40	514.94	305.38	926.45	79.66
MEAN	2.22	0.98	0.000	0.000	1.63	0.000	3.41	0.69	17.2	9.85	29.9	2.66
AC-FT	136	58	0	0	90	0	203	42	1020	606	1840	158
MAX	14	14	0.00	0.00	23	0.00	8.1	8.0	359	157	359	22
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAL YR	2010	TOTAL	15785.42	MEAN	43.2	MAX	1080	MIN	0.00	AC-FT	31310	
WTR YR	2011	TOTAL	2093.78	MEAN	5.74	MAX	359	MIN	0.00	AC-FT	4150	

MAX DISCH: 1720 CFS AT 18:45 ON JUN 20,2011 GH 4.77 FT SHIFT 0.04 FT

MAX GH: 4.77 FT AT 18:45 ON JUN 20,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

07126500 PURGATOIRE RIVER AT NINEMILE DAM NEAR HIGBEE
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
NINEMILE CANAL AT NINEMILE DAM NEAR HIGBEE
Water Year 2011

Location.--	Lat. 37°42'53", Long. 103°30'38", in NW¼ sec. 7, T.27 S., R.54 W., Otero County.
Drainage Area and Period of Record.--	N/A.
Equipment.--	Float-activated graphic water-stage recorder, SDI shaft encoder, and a High Data Rate Sutron SatLink DCP in a 3 ft by 3 ft steel shelter with well. Six-foot standard concrete Parshall flume is the control. Primary reference gage is outside staff gage installed in flume. No changes this water year.
Hydrologic Conditions.--	The Ninemile Canal diverts water from the Purgatoire River approximately 75 miles downstream from Trinidad Reservoir. The basin as a whole encompasses approximately 2870 square miles with nearly 18 percent of the basin above 7500 feet in elevation and the mean elevation at 6270 feet. Mean annual precipitation for the basin is approximately 16.8 inches. The influence of urbanization in the basin along with reservoir operations and irrigation practices provides the largest affect to the runoff regime. No changes evident this water year.
Gage-Height Record.--	Primary record is 15-minute satellite data with the graphic chart recorder and DCP log used for backup purposes. Record is complete and reliable, except for the periods January 10-26, 2011 and February 6-11, 2011 when the stage-discharge relationship was affected by ice; and low to no flow periods from the beginning of the water year till June 16, 2011, when the stilling well was filled with mud above lower intake and floats were stuck on mud. Datum corrections were applied to adjust for mud in stilling well when appropriate.
Datum Corrections.--	No levels were run to the flume this water year.
Rating.--	Control is a standard 6-ft concrete Parshall Flume. A standard 6-foot Parshall flume rating was used the entire water year. No discharge measurements were made this water year. The peak gage height of 2.41 ft. occurred at 0715 January 13, 2011 and was ice affected. The peak discharge of 80.1 cfs occurred at 0900 on February 25, 2011 at a gage height of 1.82 ft (gage height correction of +0.31 ft applied) with a shift of 0.00 ft.
Discharge.--	No discharge measurements were made this water to confirm the accuracy of the standard Parshall flume rating curve. Historically, measurements have been adjusted to provide for a zero shift at this structure. Discharge record was computed by direct application of the rating to the corrected gage height record. The standard rating curve appears applicable given the R-Error for measurements over the last eight years averages -0.44%.
Special Computations.--	Flows during periods of ice effect were estimated using temperature records, partial day good record and good record before and after ice effect.
Remarks.--	Record is fair due to lack of measurements, except for periods of ice effect and low to no flows periods of mud in stilling well, which are estimated and considered poor. The peak flow and gage height are rated fair due to lack of measurements, even though a water commissioner was able to observe the peak through a control structure. Station maintained and record developed by Garrett Markus.
Recommendations.--	Discharge measurements should be scheduled once per year during the irrigation season to verify the accuracy of the standard rating table. Additionally, a levels survey and flume inspection should be completed to verify the condition of the flume.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

NINEMILE CANAL AT NINEMILE DAM NEAR HIGBEE

RATING TABLE-- STD06FTP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

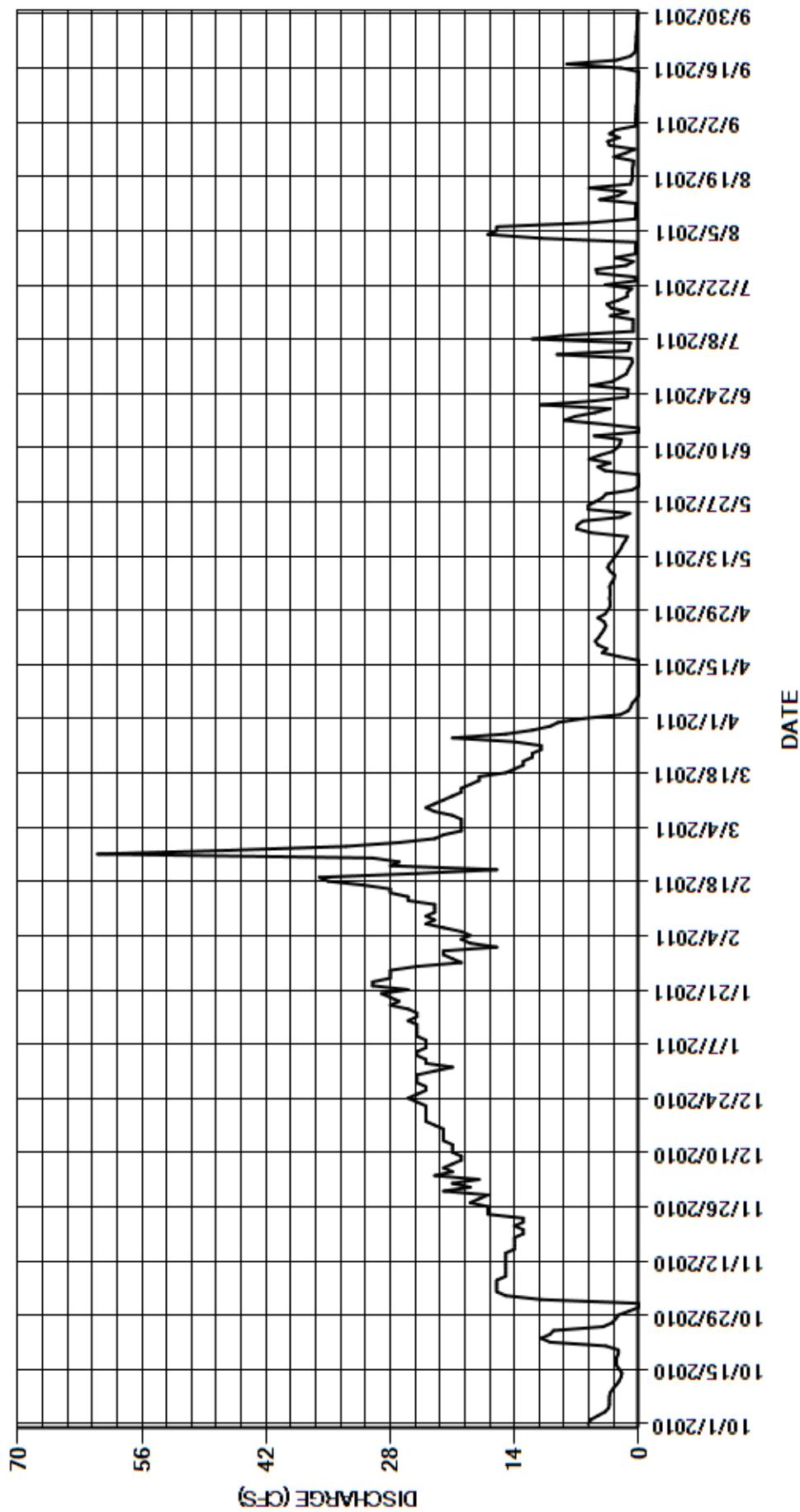
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.7	0.00	19	21	16	23	6.3	3.2	0.00	0.97	0.35	0.36
2	5.4	11	21	24	19	22	2.1	3.3	0.00	0.72	0.29	0.35
3	4.6	15	18	24	20	20	1.2	3.2	0.00	0.82	11	0.35
4	3.8	16	23	25	19	20	0.89	3.2	3.8	9.2	17	0.32
5	3.4	16	21	25	20	20	0.73	3.3	4.6	1.2	16	0.27
6	3.3	16	22	24	e22	20	0.31	3.1	3.2	1.1	16	0.27
7	3.3	16	21	24	e24	21	0.00	2.8	5.6	0.95	5.6	0.21
8	3.3	15	20	24	e23	23	0.00	2.7	4.4	12	0.42	0.20
9	3.2	15	20	25	e24	24	0.00	3.2	2.9	7.8	0.35	0.15
10	2.9	15	21	e25	e23	23	0.00	3.5	2.4	0.61	0.35	0.14
11	2.5	15	21	e25	e23	22	0.00	3.3	2.1	0.65	0.34	0.09
12	2.2	15	21	e25	23	21	0.00	2.9	2.0	0.63	0.27	0.09
13	2.0	15	22	e26	26	20	0.00	2.6	5.0	0.61	4.4	0.05
14	1.9	15	22	e25	26	20	0.00	2.3	0.00	3.2	2.3	0.05
15	2.2	14	22	e25	28	19	0.00	2.0	0.00	1.2	1.5	0.02
16	2.5	14	22	e26	28	18	0.00	1.8	3.9	3.1	5.6	2.0
17	2.5	14	23	e28	31	18	2.2	1.5	8.4	3.6	0.92	8.1
18	2.5	14	24	e27	35	15	4.1	1.3	7.2	2.3	0.77	2.5
19	2.3	13	24	e28	36	14	3.6	5.4	4.9	1.3	0.71	0.97
20	2.3	13	24	e29	25	13	4.6	7.0	3.2	1.3	0.71	0.44
21	3.7	14	24	e26	16	13	4.9	6.9	11	0.79	0.71	0.35
22	10	13	24	e30	28	12	4.5	6.3	5.1	3.8	0.62	0.34
23	11	13	25	e30	27	12	4.2	2.0	1.3	0.37	0.59	0.27
24	10	17	26	e28	30	11	3.9	1.0	1.2	0.43	2.8	0.27
25	9.6	17	25	e28	61	11	3.7	5.7	1.2	4.7	1.5	0.23
26	4.0	17	24	e28	46	14	3.9	5.7	5.4	4.8	0.43	0.20
27	3.0	19	24	25	33	21	4.6	4.9	3.0	1.4	3.3	0.20
28	2.6	18	25	20	27	15	3.8	4.1	2.2	0.61	3.5	0.16
29	2.3	17	25	21	---	12	3.5	3.7	1.4	2.6	2.2	0.14
30	1.1	22	25	22	---	10	3.2	0.80	1.2	0.36	3.3	0.10
31	0.00	---	23	22	---	9.1	---	0.00	---	0.35	2.6	---
TOTAL	119.10	444.00	701	785	759	536.1	66.23	102.70	96.60	73.47	106.43	19.19
MEAN	3.84	14.8	22.6	25.3	27.1	17.3	2.21	3.31	3.22	2.37	3.43	0.64
AC-FT	236	881	1390	1560	1510	1060	131	204	192	146	211	38
MAX	11	22	26	30	61	24	6.3	7.0	11	12	17	8.1
MIN	0.00	0.00	18	20	16	9.1	0.00	0.00	0.00	0.35	0.27	0.02
CAL YR	2010	TOTAL	3836.36	MEAN	10.5	MAX	36	MIN	0.00	AC-FT	7610	
WTR YR	2011	TOTAL	3808.82	MEAN	10.4	MAX	61	MIN	0.00	AC-FT	7550	

MAX DISCH: 80.1 CFS AT 09:00 ON FEB 25,2011 GH 2.13 FT SHIFT 0 FT

MAX GH: 2.41 FT AT 07:15 ON JAN 13,2011 (Ice Affected)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

NINEMILE CANAL AT NINEMILE DAM NEAR HIGBEE
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
PURGATOIRE RIVER AT NINEMILE DAM, NEAR HIGBEE (C
Water Year 2011

Location.--	Combined record from Purgatoire River at Ninemile Dam and Ninemile Canal below Ninemile Dam gages both located at Lat 37°42'53", long 103°30'38", in NW¼ sec. 7, T.27 S., R.54 W., Otero County, Hydrologic Unit 11020010, on left bank at Ninemile Dam, 4 mi southwest of Higbee, and 5.5 mi upstream from Smith Canyon.
Drainage Area and Period of Record.--	2,752 mi ² .
Equipment.--	See individual records for gage equipment descriptions.
Hydrologic Conditions.--	See individual station analyses.
Gage-Height Record.--	See individual records for gage height record analyses.
Datum Corrections.--	See individual station analyses.
Rating.--	See individual station analyses.
Discharge.--	The combined record of discharges was obtained by the addition of daily flows from the Ninemile Canal to the corresponding daily flows in the Purgatoire River at Ninemile Dam. The peak unit value combined discharge for the year was 1720 cfs at 1845 on June 20, 2011. See individual station analyses.
Special Computations.--	
Remarks.--	Combined record is fair, except record should be considered poor during periods of estimated flow and during periods where discharge in the river exceeds 500 cfs, above which the rating has not been verified by measurements. See individual records for more details. Record developed by Div. 2 hydrographic staff.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

PURGATOIRE RIVER AT NINEMILE DAM, NEAR HIGBEE (C)

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

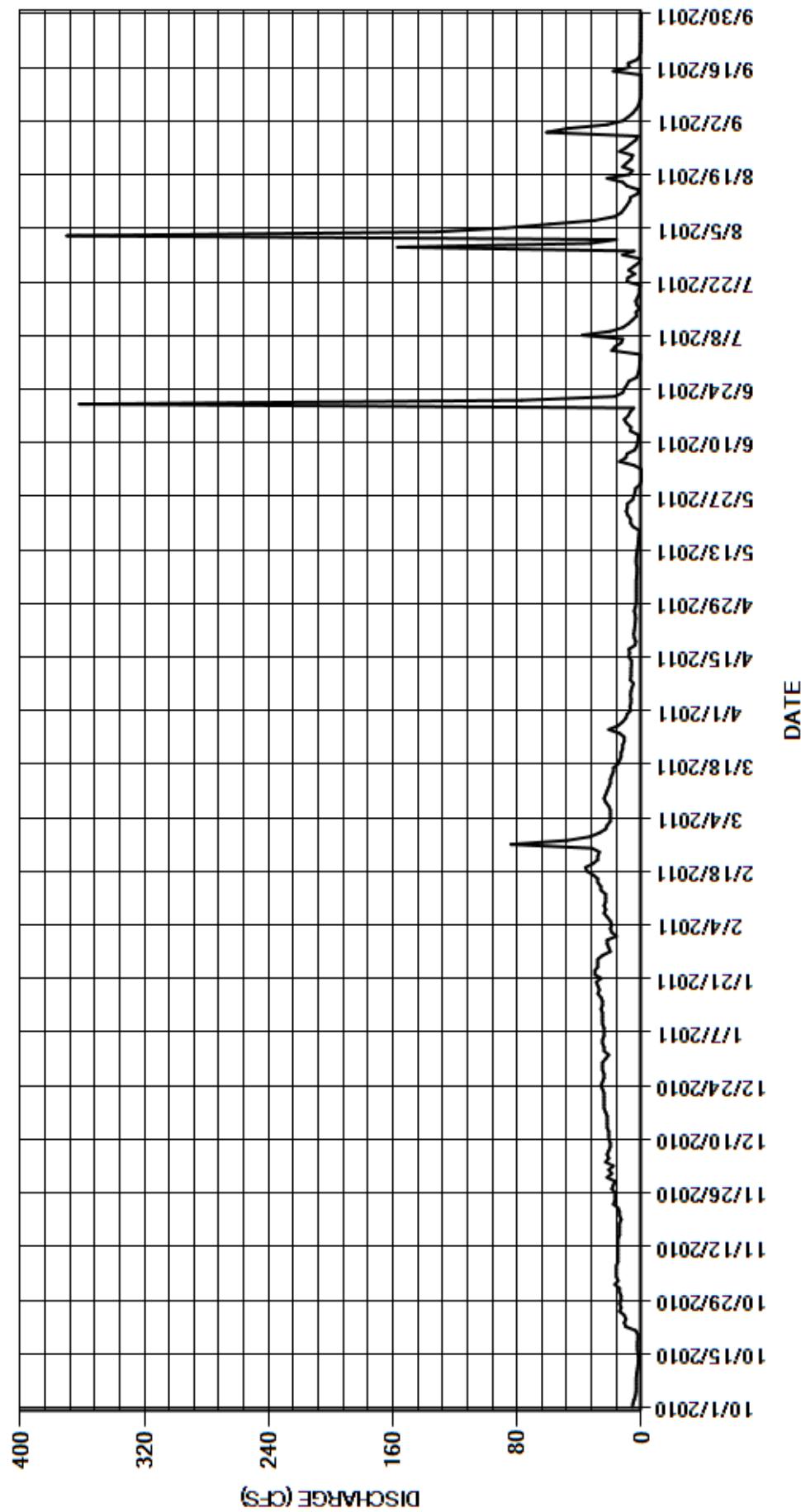
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.7	14	19	21	16	23	6.9	3.2	0.00	0.97	33	22
2	5.4	17	21	24	19	22	7.4	3.3	0.00	0.72	16	12
3	4.6	15	18	24	20	20	6.7	3.2	0.00	0.82	370	8.6
4	3.8	16	23	25	19	20	6.7	3.2	4.6	19	132	5.6
5	3.4	16	21	25	20	20	7.0	3.3	14	17	88	3.5
6	3.3	16	22	24	e22	20	6.7	3.1	10	13	59	1.9
7	3.3	16	21	24	e24	21	6.0	2.8	9.3	12	30	1.2
8	3.3	15	20	24	e23	23	5.1	2.7	4.4	38	17	0.43
9	3.2	15	20	25	e24	24	7.1	3.2	2.9	20	13	0.30
10	2.9	15	21	e25	e23	23	6.7	3.5	2.4	12	11	0.27
11	2.5	15	21	e25	e23	22	6.6	3.3	2.1	8.4	9.2	0.17
12	2.2	15	21	e25	23	21	6.6	2.9	2.0	5.7	7.6	0.22
13	2.0	15	22	e26	26	20	6.4	2.6	7.1	3.1	7.0	0.17
14	1.9	15	22	e25	26	20	6.4	2.3	6.7	3.5	2.3	0.21
15	2.2	14	22	e25	28	19	8.1	2.0	9.5	1.2	1.6	18
16	2.5	14	22	e26	28	18	7.6	1.8	11	3.1	9.3	7.7
17	2.5	14	23	e28	31	18	8.0	1.5	8.4	3.6	12	8.6
18	2.5	14	24	e27	35	15	4.1	1.3	7.2	2.3	22	2.7
19	2.3	13	24	e28	36	14	3.6	5.4	4.9	1.3	7.8	1.1
20	2.3	14	24	e29	31	13	4.6	7.0	362	1.3	5.7	0.55
21	3.7	14	24	e26	28	13	4.9	6.9	77	0.79	12	0.39
22	10	15	24	e30	28	12	4.5	8.8	17	9.2	9.4	0.47
23	11	18	25	e30	27	12	4.2	9.7	12	8.7	6.6	0.34
24	10	17	26	e28	32	11	3.9	9.0	11	4.2	5.6	0.33
25	11	17	25	e28	84	11	3.7	8.9	9.4	8.2	14	0.30
26	14	17	24	e28	48	14	3.9	5.7	8.0	4.8	9.9	0.31
27	13	19	24	25	33	21	4.6	4.9	3.0	1.4	6.8	0.36
28	14	18	25	20	27	15	3.8	4.1	2.2	0.61	3.6	0.30
29	13	17	25	21	---	12	3.5	3.7	1.4	12	2.3	0.15
30	13	22	25	22	---	10	3.2	0.80	1.2	4.7	61	0.10
31	14	---	23	22	---	9.1	---	0.00	---	157	48	---
TOTAL	188.5	472	701	785	804	536.1	168.5	124.10	610.70	378.61	1032.7	98.27
MEAN	6.08	15.7	22.6	25.3	28.7	17.3	5.62	4.00	20.4	12.2	33.3	3.28
AC-FT	374	936	1390	1560	1590	1060	334	246	1210	751	2050	195
MAX	14	22	26	30	84	24	8.1	9.7	362	157	370	22
MIN	1.9	13	18	20	16	9.1	3.2	0.00	0.00	0.61	1.6	0.10
CAL YR	2010	TOTAL	19983.80	MEAN	54.8	MAX	1110	MIN	1.9	AC-FT	39640	
WTR YR	2011	TOTAL	5899.48	MEAN	16.2	MAX	370	MIN	0.00	AC-FT	11700	

MAX DISCH: 1720 CFS AT 18:45 ON JUN 20,2011

MAX GH: 0.00 FT

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PURGATOIRE RIVER AT NINEMILE DAM, NEAR HIGBEE (C)
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
PURGATOIRE RIVER BLW HIGHLAND DAM NR LAS ANIMAS
Water Year 2011

Location.--	Lat. 37°54'03", Long. 103°17'56" (Hackamore Ranch, CO Quadrangle, Scale 1:24,000), NE1/4, SW1/4, Section 1, T25S, R53W. On the left bank approximately ¼ mile downstream of the Highland Canal Diversion Dam, Bent County, 11 mi southwest of Las Animas, Colorado.
Drainage Area and Period of Record.--	3253.14 sq.mi.
Equipment.--	Sutron Constant Flow Bubbler water level sensor and a Satlink 2 satellite-monitored high data rate data collection platform is installed in a 4 ft x 4 ft steel shelter. Primary reference gage is a drop tape gage referenced to the top of "C" channel attached to face of concrete flood block on left channel bank holding bubbler orifice line. The 8210 platform was replaced with the Satlink 2 platform on July 29, 2011. No other changes were made this water year.
Hydrologic Conditions.--	The Purgatoire River below Highland Dam has a drainage basin of approximately 3320 square miles. Characteristics within the basin include uplands and hills forested with pine and juniper trees. Rolling short-grass prairie lies between the uplands and the canyons. Livestock grazing exists in the watershed. Rock cliffs are exposed along the 400- to 500-foot deep Purgatoire River canyon, and riparian vegetation grows along the bottom of incised reaches of the major tributaries near their confluence with the Purgatoire River. The months of November through March tend to produce little runoff because precipitation is mainly snow. Sublimation and slow melting remove water from the snowpack during warm periods of the winter. These processes might increase soil moisture but they also decrease the volume of surface water. Precipitation from April through October generally is in the form of snow that melts rapidly or high intensity-short duration rainfall, which produces the vast majority of the streamflow in the tributaries. Snowmelt from the mountains generally produces high flow in the Purgatoire River during the months May through June and storm runoff also generates streamflow. The Purgatoire River will generally convey the most streamflow in August. Typically, the increased streamflows in August were a result of mountain snowmelt stored in upstream reservoirs that was subsequently released for downstream irrigation needs. The August increased streamflows also may be a result of convective storms that commonly occur during the late July through August summer monsoon. The influence of urbanization and over grazing provides the largest affect to the runoff regime.
Gage-Height Record.--	Primary record is 15-minute satellite-monitored constant flow bubbler data with DCP log backup. Record is complete and reliable, except for the following periods: October 1, 2010 - June 21, 2011, when gage heights were affected by a downstream beaver dam. Short periods of missing unit value satellite data were filled in without loss of accuracy on July 29 when the DCP was replaced. Data was filled in using trends in adjacent data given the short time periods and gage height stability without loss of accuracy. Primary stage sensor calibration to reference gage is supported by 31 visits and 15 measurements made this water year.
Datum Corrections.--	Levels were last run August 22, 2008 to the water surface and the drop tape RP using RM No. 1 as base. No corrections were required.
Rating.--	The control at low to medium flows (up to 500 cfs) is the primary channel with silt, sand, gravel and cobble bed and earthen banks. Bank vegetation of variable density in secondary overbank areas (primarily left side) affects flows above 500 cfs considerably. Rating No. 3, dated October 1, 2003 was used for the entire water year. It is well-defined to approximately 500 cfs, which is considered to be the primary channel capacity. Above 500 cfs, flow spills out of the channel and the control changes – this portion of the rating is based on a channel survey. Fifteen discharge measurements (Nos. 171 – 185) were made during the water year ranging from 0.00 to 13.1 cfs. Measurements cover the range in stage experienced except for the following higher flow days: March 9-10, June 21-23, July 8-9, July 31-August 9, August 30-September 2, 2011. The peak discharge of 2500 cfs occurred at 0415 on June 21, 2011 at a gage height of 7.43 ft with a shift of -0.14 ft. It exceeded the stage of maximum flow measurement for the water year (No. 177 made on March 11, 2011) by 5.78 ft.
Discharge.--	Shifting control method was used for the entire water year. Shifts were distributed throughout the water year using the following methods: time prorated from 0000 October 1, 2010 through 2345 February 25, 2011 during periods of beaver dam backwater affects that were introduced in the previous year. Time proration was used during from 0000 February 26 to 2345 March 3 in efforts to transition onto shift cdurve PURHILCOBVSC01. PURHILCOBVSC01 was created using measurements 177 - 182 which were all affected by a partial beaver dam. Shifts were distributed by stage using PURHILCOBVSC01 from 0000 March 4 - 2345 June 20, 2011 and then using PURHILCOVSC02B from 0000 June 21 – 2345 September 30, 2011 following the complete removal of the beaver dam affect. PURHILCOVSC02B was a refined version of last year's PURHILCOSC1. Open water measurements showed shifts varying between -0.01 to -1.97 feet. All open water measurements were given full weight except for Measurements 178, 179, and 180 which were discounted - 5.88%, 6.11% and -8.03% for smoothing purposes.
Special Computations.--	Discharges during ice-affected periods were determined by examination of Las Animas NOAA air temperature data; trends in gage height before, during, and after ice affected periods; and comparison with flows at upstream gage Purgatoire River at Ninemile Dam. Missing data was replaced in most cases with DCP log data. On days when the log data was also missing, the missing unit values were interpolated between two adjacent values for the two sets of four 15-minute periods since the periods were short and the gage height was relatively stable.
Remarks.--	Record fair, except during periods when flows were estimated and when flows exceed 500 cfs, since such flows are unmeasurable at this location, which should be considered poor. The peak flow for the water year is also poor. Station maintained and record developed by Garrett Markus.

Recommendations.--

High flows have not been measured at or near the gage due to a lack of facilities. Recommend installation of a bank operated cableway.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

PURGATOIRE RIVER BLW HIGHLAND DAM NR LAS ANIMAS

RATING TABLE-- PURHILCO03 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.13	8.9	1.0	e0.00	0.08	0.00	4.5	1.1	0.23	0.26	88	49
2	0.18	8.1	1.0	e0.00	0.08	0.04	3.1	0.16	0.53	0.44	33	22
3	0.22	6.9	0.04	e0.00	0.03	2.5	3.1	0.17	0.57	0.65	102	9.4
4	0.18	3.1	0.00	e0.00	0.19	5.9	4.9	0.26	0.64	0.52	400	4.2
5	0.19	0.70	0.15	e0.00	0.31	6.1	7.4	0.60	0.54	29	132	1.5
6	0.29	1.6	0.29	e0.00	0.23	7.5	7.4	1.8	0.58	20	112	0.13
7	0.75	1.1	0.15	e0.00	0.18	6.5	8.0	2.4	0.54	9.7	60	0.03
8	1.0	0.56	0.11	e0.00	0.17	11	8.2	1.7	0.58	252	33	0.00
9	1.4	0.49	0.06	e0.00	0.05	18	7.6	1.2	0.69	28	17	0.00
10	1.5	0.44	0.01	e0.00	0.09	16	5.9	0.78	0.81	6.7	9.7	0.00
11	1.4	0.06	0.05	e0.00	0.06	12	9.5	0.16	0.79	8.3	6.5	0.00
12	1.1	0.00	0.19	e0.00	0.07	12	9.3	0.13	0.74	3.8	3.7	0.00
13	0.78	0.03	0.17	e0.00	0.09	5.5	9.0	0.10	0.52	1.1	1.4	0.00
14	0.49	0.00	0.06	e0.00	0.14	4.9	8.6	0.07	0.28	0.16	0.14	0.00
15	0.22	0.00	0.00	e0.00	0.10	7.3	8.4	0.06	0.16	0.15	0.05	0.00
16	0.13	0.04	0.00	e0.00	0.04	9.0	8.4	0.07	0.09	0.13	0.03	0.00
17	0.06	0.52	0.07	e0.00	0.00	5.6	11	0.08	0.10	0.14	0.02	0.00
18	0.02	0.55	0.52	e0.00	0.00	5.2	10	0.11	0.10	0.17	0.02	1.9
19	0.02	0.30	0.75	e0.00	0.09	3.6	8.7	0.11	0.09	0.17	4.5	1.1
20	0.02	0.86	0.76	e0.00	0.05	2.5	6.4	0.12	0.58	0.20	2.7	0.26
21	0.02	0.88	0.43	e0.00	0.04	3.5	4.0	0.09	832	5.8	0.14	0.09
22	0.03	0.75	0.01	e0.00	0.29	3.4	3.3	0.09	56	60	0.02	0.07
23	0.02	0.99	0.37	e0.00	0.03	2.7	2.0	0.09	18	1.7	0.00	0.05
24	0.02	0.81	e0.00	e0.00	0.00	2.3	1.8	0.11	11	2.2	0.02	0.02
25	0.02	1.2	e0.00	e0.00	1.5	2.4	2.1	0.11	8.0	0.23	0.01	0.03
26	0.02	1.7	e0.00	e0.00	1.6	2.5	2.7	3.8	4.8	0.09	0.00	0.02
27	0.02	1.6	e0.00	e0.00	0.00	3.1	3.1	2.4	2.1	0.10	0.00	0.02
28	0.00	1.6	e0.00	e0.00	0.00	7.2	3.1	0.79	0.41	0.09	0.00	0.02
29	0.00	1.8	e0.00	e0.00	---	6.1	2.4	0.21	0.24	0.09	0.03	0.02
30	3.8	1.4	e0.00	e0.00	---	7.6	2.3	0.17	0.21	0.07	15	0.01
31	8.5	---	e0.00	e0.00	---	4.8	---	0.23	---	43	51	---
TOTAL	22.53	46.98	6.19	0.00	5.51	186.74	176.2	19.27	941.92	474.96	1071.98	89.87
MEAN	0.73	1.57	0.20	0.000	0.20	6.02	5.87	0.62	31.4	15.3	34.6	3.00
AC-FT	45	93	12	0	11	370	349	38	1870	942	2130	178
MAX	8.5	8.9	1.0	0.00	1.6	18	11	3.8	832	252	400	49
MIN	0.00	0.00	0.00	0.00	0.00	0.00	1.8	0.06	0.09	0.07	0.00	0.00

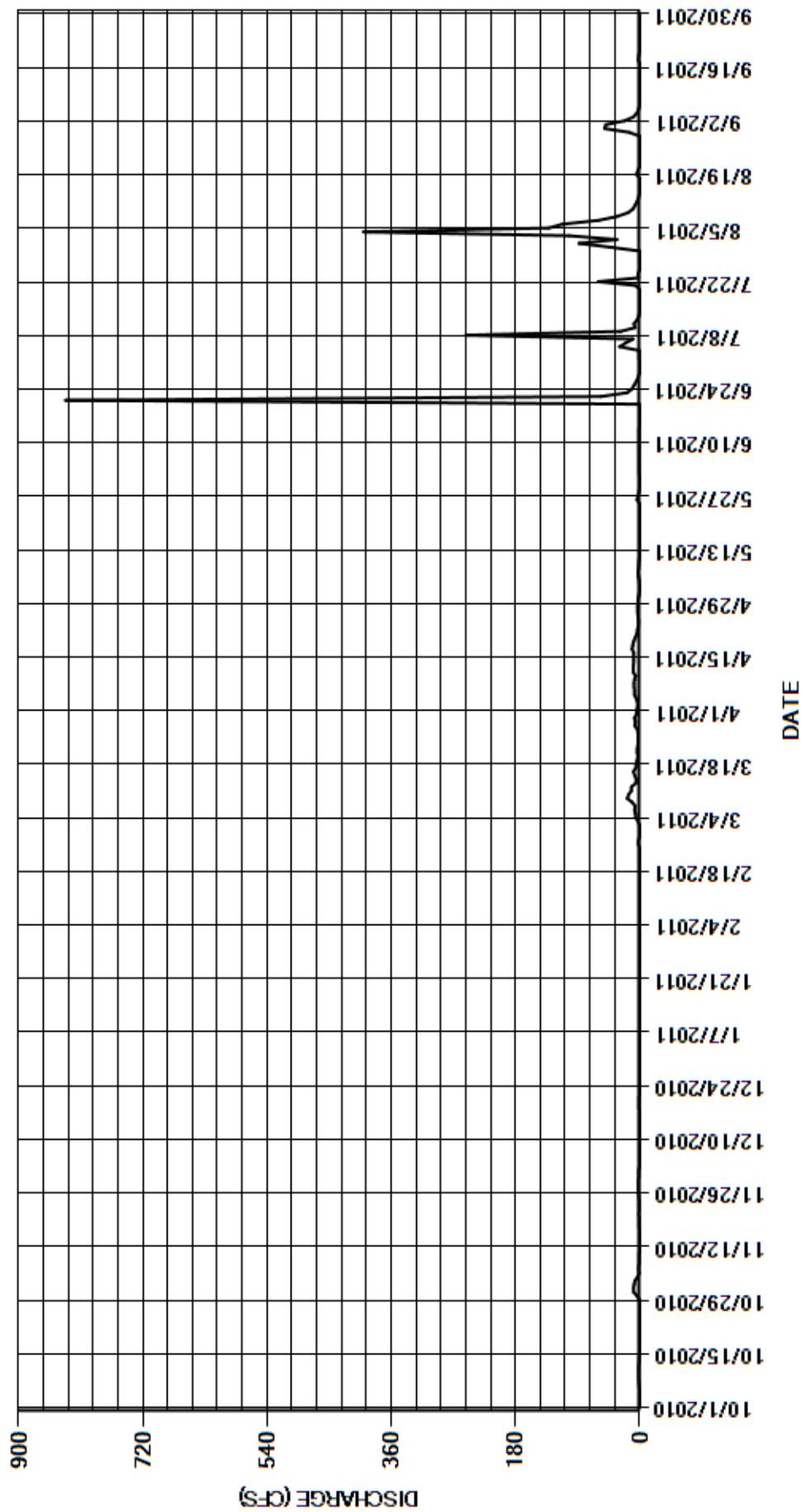
CAL YR	2010	TOTAL	23097.94	MEAN	63.3	MAX	1640	MIN	0.00	AC-FT	45810
WTR YR	2011	TOTAL	3042.15	MEAN	8.33	MAX	832	MIN	0.00	AC-FT	6030

MAX DISCH: 2500 CFS AT 04:15 ON JUN 21,2011 GH 7.43 FT SHIFT -0.14 FT

MAX GH: 7.43 FT AT 04:15 ON JUN 21,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PURGATOIRE RIVER BLW HIGHLAND DAM NR LAS ANIMAS
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN

HIGHLAND CANAL

Water Year 2011

Location.--	Lat. 37°54'03", Long. 103°17'56" (Hackamore Ranch, CO Quadrangle, Scale 1:24,000), NE1/4, SW1/4, Section 1, T25S, R53W. On the left bank approximately ¼ mile downstream of the Highland Canal Diversion Dam, Bent County, 11 mi southwest of Las Animas, Colorado.
Drainage Area and Period of Record.--	N/A
Equipment.--	Float-activated graphic water-stage recorder and shaft encoder in small shelter over CMP stilling well. Shaft encoder wired to satellite-monitored data collection platform (Sutron Satlink 2 HDR DCP) located in Purgatoire River below Highland Dam gage shelter. Standard 5-ft steel Parshall flume is the control. Primary reference gage is outside staff gage installed in flume. The 8210 platform was replaced by the Satlink 2 platform on July 29, 2011.
Hydrologic Conditions.--	The Highland Canal diverts water from the Purgatoire River which has a drainage basin of approximately 2623 square miles. Purgatoire River basin characteristics include uplands and hills forested with pine and juniper trees. Rolling short-grass prairie lies between the uplands and the canyons. Livestock grazing exists in the watershed. Rock cliffs are exposed along the 400- to 500- foot deep Purgatoire River canyon, and riparian vegetation grows along the bottom of incised reaches of the major tributaries near their confluence with the Purgatoire River. The months of November through March tend to produce little runoff because precipitation is mainly snow. Sublimation and slow melting remove water from the snowpack during warm periods of the winter. These processes might increase soil moisture but they also decrease the volume of surface water. Precipitation from April through October generally is in the form of snow that melts rapidly or high intensity-short duration rainfall, which produces the vast majority of the streamflow in the tributaries. Snowmelt from the mountains generally produces high flow in the Purgatoire River during the months May through June and storm runoff also generates streamflow. The Purgatoire River will generally convey the most streamflow in August. Typically, the increased streamflows in August were a result of mountain snowmelt stored in upstream reservoirs that was subsequently released for downstream irrigation needs. The August increased streamflows also may be a result of convective storms that commonly occur during the late July through August summer monsoon. The influence of urbanization and over grazing provides the largest affect to the runoff regime.
Gage-Height Record.--	Primary record is 15-minute satellite data with the graphic chart record and DCP log used for backup purposes. Record is complete and reliable for this seasonally operated gage. The chart was relied upon without loss of accuracy during the periods: July 29, 2011 when the 8210 was replaced by the Satlink 2 and the canal shaft encoder was reset. Throughout the irrigation season of May to September, silt in stilling well affected gage height reliability at low to no flow. Gage heights during the month of June, July, and August thru September were forced to produce zero flow for gage heights less than or equal to 0.12 ft, 0.14 ft, and 0.17 ft, respectively. Each condition was applied at the beginning of the month to the end of the month specified.
Datum Corrections.--	Levels were last run to the flume on August 5, 2003. No corrections needed.
Rating.--	The control is a standard, 5-foot, steel Parshall flume. A standard 5-ft Parshall flume rating table, in use since May 23, 2001 was used during the entire water year. The peak discharge of 8.89 cfs occurred at 0815 on May 26, 2011, at a gage height of 0.60 ft with a shift of 0.00 ft.
Discharge.--	Shifting control method was used for the entire water year. The shift of 0.00 ft was applied for the entire water year.
Special Computations.--	Due to silt in the stilling well, primary data was imported conditionally by applying zero flow at gage heights that were compromised.
Remarks.--	Record is good except for periods of low flow when the shaft encoder was affected / held by silt in the stilling well which are considered poor. Station maintained and record developed by Garrett Markus.
Recommendations.--	A levels survey and flume inspection before water year 2012 season.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

HIGHLAND CANAL

RATING TABLE-- STD05FTP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

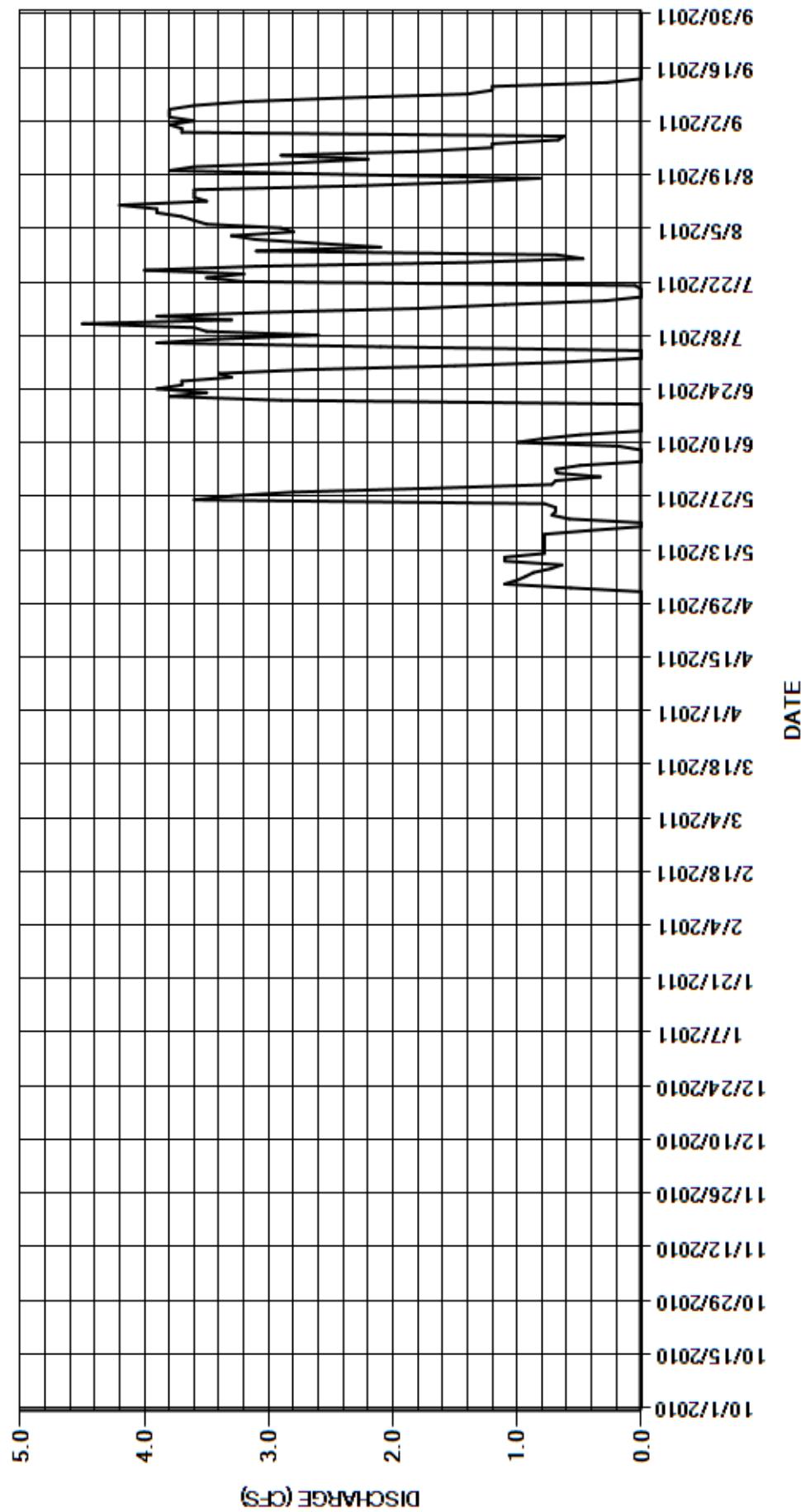
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.60	2.6	3.8
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.68	0.00	3.1	3.6
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.57	0.69	0.00	3.3	3.8
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.1	0.49	0.00	2.8	3.8
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	0.00	2.1	2.9	3.8
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.93	0.00	3.9	3.5	3.6
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.87	0.00	3.4	3.6	3.2
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.73	0.00	2.6	3.7	2.4
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.64	0.18	3.5	3.9	1.4
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.1	1.0	3.6	3.9	1.2
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.1	0.79	4.5	4.2	1.2
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.78	0.49	3.3	3.5	0.28
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.78	0.00	3.9	3.6	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.78	0.00	3.0	3.6	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.78	0.00	1.8	3.6	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.78	0.00	1.1	2.3	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.78	0.00	0.29	1.4	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.41	0.00	0.00	0.82	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.4	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.58	2.9	0.05	3.6	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.72	3.8	3.2	2.8	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.69	3.5	3.5	2.2	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.69	3.9	3.2	2.9	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.78	3.7	4.0	1.8	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.6	3.7	3.1	1.2	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.3	3.3	1.4	1.2	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.8	3.4	0.47	0.67	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	1.7	2.7	0.68	0.62	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.72	1.5	3.1	3.7	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.69	---	2.1	3.7	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29.40	37.05	62.39	86.91	32.08
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.95	1.24	2.01	2.80	1.07
AC-FT	0	0	0	0	0	0	0	58	73	124	172	64
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.6	3.9	4.5	4.2	3.8
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62	0.00
CAL YR	2010	TOTAL	512.30	MEAN	1.40	MAX	5.0	MIN	0.00	AC-FT	1020	
WTR YR	2011	TOTAL	247.83	MEAN	0.68	MAX	4.5	MIN	0.00	AC-FT	492	

MAX DISCH: 8.89 CFS AT 08:15 ON MAY 26,2011 GH 0.60 FT SHIFT 0 FT

MAX GH: 0.60 FT AT 08:15 ON MAY 26,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

HIGHLAND CANAL
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
PURGATOIRE RIVER BELOW HIGHLAND DAM NEAR LAS ANIMA
Water Year 2011

Location.--	Combined record from Purgatoire River below Highland Dam and Highland Canal below Highland Dam gages located Lat 37°54'03", Long 103°17'56" (Hackamore Ranch, CO Quadrangle, Scale 1:24,000), NE1/4, SW1/4, Section 1, T25S, R53W. On the left bank approximately ¼ mile downstream of the Highland Canal Diversion Dam, Bent County, 11 mi southwest of Las Animas, Colorado.
Drainage Area and Period of Record.--	N/A.
Equipment.--	See individual records for gage equipment descriptions.
Hydrologic Conditions.--	See individual station analyses.
Gage-Height Record.--	See individual station analyses.
Datum Corrections.--	See individual station analyses.
Rating.--	See individual station analyses.
Discharge.--	The combined record of discharges was obtained by the addition of Highland Canal daily flows to the corresponding daily flows in the Purgatoire River below Highland Dam. The peak unit value combined discharge for the water year was 2500 cfs at 0415 on June 21, 2011. See individual station analyses.
Special Computations.--	None.
Remarks.--	Combined record is fair, except during periods of estimated flow and flows greater than 500 cfs, which should be considered poor. See individual station analyses for the two gages for more details. Record developed by Div. 2 hydrographic staff.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

PURGATOIRE RIVER BELOW HIGHLAND DAM NEAR LAS ANIMAS

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

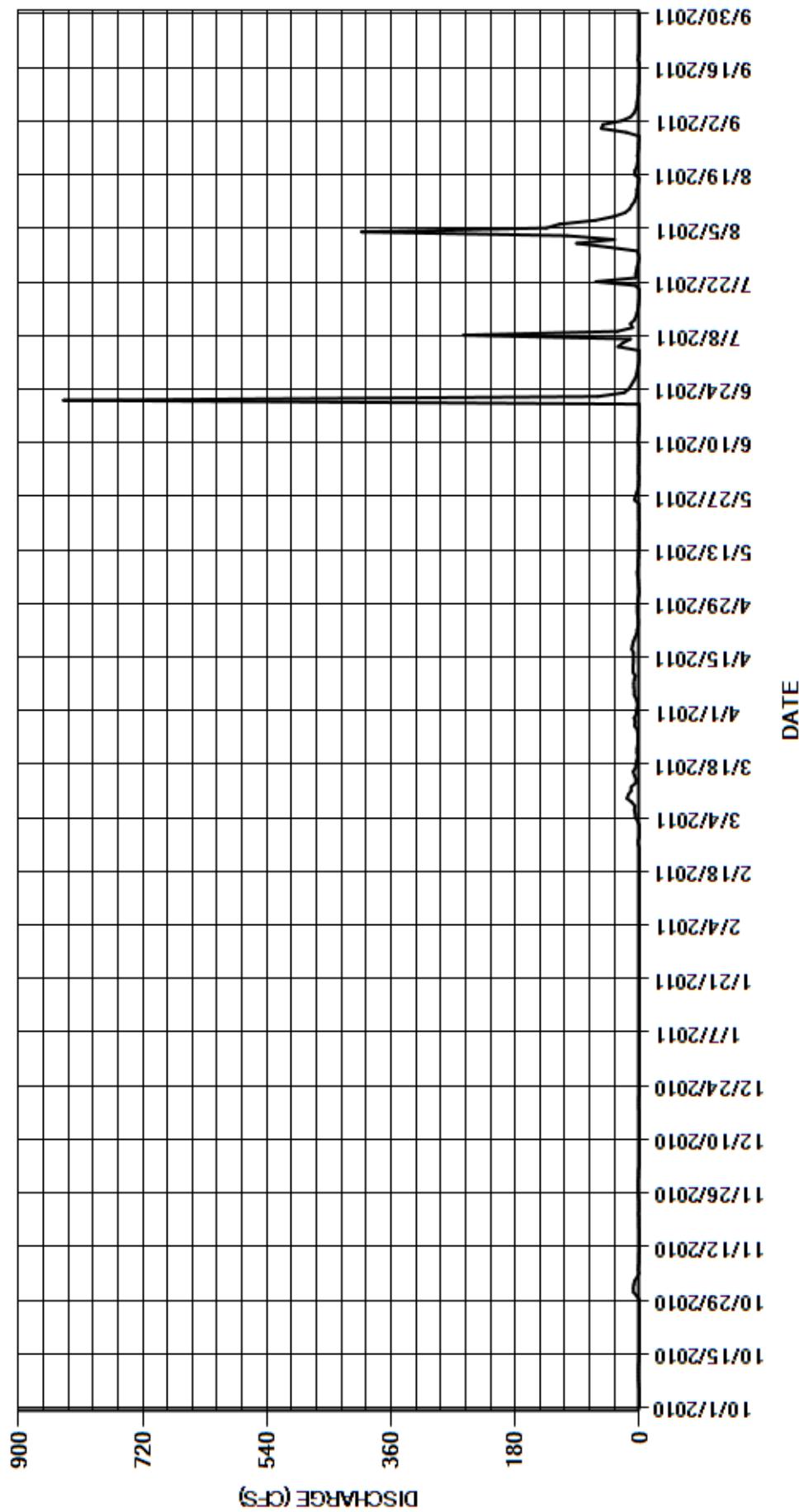
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.13	8.9	1.0	e0.00	0.08	0.00	4.5	1.1	0.56	0.86	91	53
2	0.18	8.1	1.0	e0.00	0.08	0.04	3.1	0.16	1.2	0.44	36	26
3	0.22	6.9	0.04	e0.00	0.03	2.5	3.1	0.74	1.3	0.65	105	13
4	0.18	3.1	0.00	e0.00	0.19	5.9	4.9	1.4	1.1	0.52	403	8.0
5	0.19	0.70	0.15	e0.00	0.31	6.1	7.4	1.6	0.54	31	135	5.3
6	0.29	1.6	0.29	e0.00	0.23	7.5	7.4	2.7	0.58	24	116	3.7
7	0.75	1.1	0.15	e0.00	0.18	6.5	8.0	3.3	0.54	13	64	3.2
8	1.0	0.56	0.11	e0.00	0.17	11	8.2	2.4	0.58	255	37	2.4
9	1.4	0.49	0.06	e0.00	0.05	18	7.6	1.8	0.87	32	21	1.4
10	1.5	0.44	0.01	e0.00	0.09	16	5.9	1.9	1.8	10	14	1.2
11	1.4	0.06	0.05	e0.00	0.06	12	9.5	1.3	1.6	13	11	1.2
12	1.1	0.00	0.19	e0.00	0.07	12	9.3	0.91	1.2	7.1	7.2	0.28
13	0.78	0.03	0.17	e0.00	0.09	5.5	9.0	0.88	0.52	5.0	5.0	0.00
14	0.49	0.00	0.06	e0.00	0.14	4.9	8.6	0.85	0.28	3.2	3.7	0.00
15	0.22	0.00	0.00	e0.00	0.10	7.3	8.4	0.84	0.16	2.0	3.6	0.00
16	0.13	0.04	0.00	e0.00	0.04	9.0	8.4	0.85	0.09	1.2	2.3	0.00
17	0.06	0.52	0.07	e0.00	0.00	5.6	11	0.86	0.10	0.43	1.4	0.00
18	0.02	0.55	0.52	e0.00	0.00	5.2	10	0.52	0.10	0.17	0.84	1.9
19	0.02	0.30	0.75	e0.00	0.09	3.6	8.7	0.11	0.09	0.17	6.9	1.1
20	0.02	0.86	0.76	e0.00	0.05	2.5	6.4	0.12	0.58	0.20	6.5	0.26
21	0.02	0.88	0.43	e0.00	0.04	3.5	4.0	0.67	835	5.8	3.7	0.09
22	0.03	0.75	0.01	e0.00	0.29	3.4	3.3	0.81	60	63	2.8	0.07
23	0.02	0.99	0.37	e0.00	0.03	2.7	2.0	0.78	22	5.2	2.2	0.05
24	0.02	0.81	e0.00	e0.00	0.00	2.3	1.8	0.80	15	5.4	2.9	0.02
25	0.02	1.2	e0.00	e0.00	1.5	2.4	2.1	0.89	12	4.2	1.8	0.03
26	0.02	1.7	e0.00	e0.00	1.6	2.5	2.7	7.4	8.5	3.2	1.2	0.02
27	0.02	1.6	e0.00	e0.00	0.00	3.1	3.1	5.7	5.4	1.5	1.2	0.02
28	0.00	1.6	e0.00	e0.00	0.00	7.2	3.1	3.6	3.8	0.56	0.67	0.02
29	0.00	1.8	e0.00	e0.00	---	6.1	2.4	1.9	2.9	1.2	0.65	0.02
30	3.8	1.4	e0.00	e0.00	---	7.6	2.3	0.89	1.7	3.2	19	0.01
31	8.5	---	e0.00	e0.00	---	4.8	---	0.92	---	45	55	---
TOTAL	22.53	46.98	6.19	0.00	5.51	186.74	176.2	48.70	980.09	538.20	1161.56	122.29
MEAN	0.73	1.57	0.20	0.000	0.20	6.02	5.87	1.57	32.7	17.4	37.5	4.08
AC-FT	45	93	12	0	11	370	349	97	1940	1070	2300	243
MAX	8.5	8.9	1.0	0.00	1.6	18	11	7.4	835	255	403	53
MIN	0.00	0.00	0.00	0.00	0.00	0.00	1.8	0.11	0.09	0.17	0.65	0.00
CAL YR	2010	TOTAL	23631.72	MEAN	64.7	MAX	1640	MIN	0.00	AC-FT	46870	
WTR YR	2011	TOTAL	3294.99	MEAN	9.03	MAX	835	MIN	0.00	AC-FT	6540	

MAX DISCH: 2500 CFS AT 04:15 ON JUN 21,2011

MAX GH: 0.00 FT

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PURGATOIRE RIVER BELOW HIGHLAND DAM NEAR LAS ANIMAS
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
MUDDY CREEK BELOW MUDDY CR DAM NR TOONERVILLE, CO
Water Year 2011

Location.--	Lat. 37°45'46", Long. 103°14'36" (Toonerville, Colorado quadrangle, 1:24000 scale) in the SE $\frac{1}{4}$ SE $\frac{1}{4}$ Sec.21, T26S, R52W, Bent County on the north bridge abutment at the crossing of CR 11 and Muddy Creek.
Drainage Area and Period of Record.--	166.95 sq. mi. The gage was established in the 1970's. It is unknown at this time how long the station was operated before it was abandoned. The station was reopened in the October of 2004 utilizing the existing stilling well.
Equipment.--	High data rate Sutron SatLink data collection platform (DCP) and shaft encoder in a steel "half shelter" mounted on top of a 24-inch corrugated metal stilling well. Shaft encoder is referenced to a drop tape from an "I" beam on the downstream side of a bridge rail. Precipitation recorded with a tipping bucket gage. No changes this water year.
Hydrologic Conditions.--	The Muddy Creek gaging station has a drainage basin of approximately 154 square miles. Characteristics within the basin include rolling short-grass prairie rangelands with weeds and cacti. Livestock grazing exists in the watershed. Ephemeral or intermittent stream channels are common and these normally dry arroyos typically convey water as the result of convective storms that commonly occur during the late July through August summer monsoon. The influence of over grazing provides the largest affect to the runoff regime. No hydrologic condition changes this water year.
Gage-Height Record.--	Primary record is 15-minute satellite-monitored data with DCP log backup. Record is complete and reliable. Missing unit values on March 13 and 22, 2011 were replaced by linear interpolation of adjacent data without loss of accuracy due to stable gage heights.
Datum Corrections.--	Levels were not run this water year. Levels were last run April 8, 2005 to establish gage datum and point of zero flow.
Rating.--	The control at low and medium flows is the sand and mud channel along with vegetation in the channel. Control at higher stages includes the creek banks and brush lining the edges of the channel. Flows are contained by the bridge immediately upstream of the gage. Rating No. 3 dated June 17, 2010 was used for entire water year and was developed from analysis of HEC-RAS modeling and field measurements. Six discharge measurements were made this water year – all with observations of zero flow. The peak flow of 792 cfs occurred at 0015 July 8, 2011 at gage height of 7.96 feet with 0.00 ft shift.
Discharge.--	Rating No. 3 was applied directly with no shifts this entire water year due to the lack of non-zero flow measurements. Gage heights less than the Point of Zero Flow (PZF) of 1.70 ft for the following periods were: 0000 Oct 1, 2010 - 1130 Jun 20, 2230 Jun 21 - 2000 Jul 7, and 2345 Jul 9 - 2345 Sept 30, 2011. A discharge of 0.00 cfs was assigned to these periods. Flow events due to rainfall runoff were recorded at the gage for the following periods when gage heights exceeded 1.70 ft: 1145 Jun 20 - 2215 Jun 21 and 2015 Jul 7 - 2330 Jul 9, 2011. Discharge for these periods were computed directly from Rating No. 3.
Special Computations.--	None.
Remarks.--	Overall, the record during periods of zero flow is good, but the record during periods of flow is poor due to lack of rating definition. The peak flow for the water year is also rated poor. The flashy nature and remote location of the gage make it extremely difficult to maintain an accurate stage-discharge rating and point of zero flow. Station maintained and record developed by Garrett Markus.
Recommendations.--	To establish a solid point of zero flow, the installation of a concrete structure such as a compound weir or broad crested weir would be beneficial for monitoring low flow periods and large, bed scouring events.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

MUDDY CREEK BELOW MUDDY CR DAM NR TOONERVILLE, CO

RATING TABLE-- MUDTOOCO003 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	51	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	104	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.3	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.2	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.50	155.18	0.00	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.28	5.01	0.000	0.000
AC-FT	0	0	0	0	0	0	0	0	17	308	0	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.3	104	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

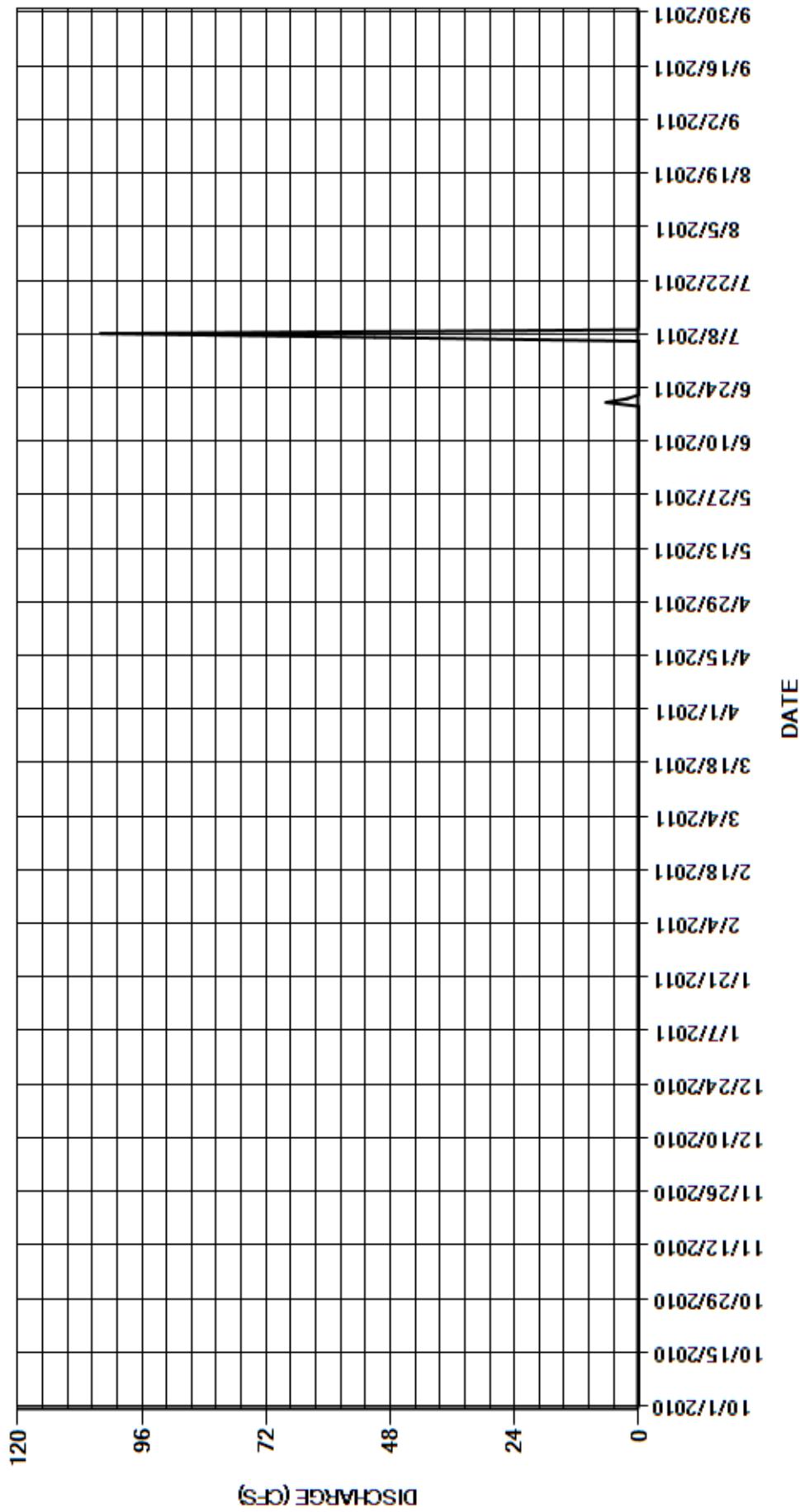
CAL YR	2010	TOTAL	38.75	MEAN	0.11	MAX	32	MIN	0.00	AC-FT	77
WTR YR	2011	TOTAL	163.68	MEAN	0.45	MAX	104	MIN	0.00	AC-FT	325

MAX DISCH: 792 CFS AT 00:15 ON JUL 08,2011 GH 7.96 FT SHIFT 0 FT

MAX GH: 7.96 FT AT 00:15 ON JUL 08,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

MUDY CREEK BELOW MUDDY CR DAM NR TOONERVILLE, CO
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
RULE CREEK AT HWY 101 NEAR TOONERVILLE, CO
Water Year 2011

Location.--	Lat. 37°49'12", Long. 103°10'55" (Toonerville, Colorado quadrangle, 1:24000 scale) in the NW¼ Sec.6, T26S, R51W, Bent County on the downstream side of a bridge abutment at the crossing of Highway 101 and Rule Creek approximately 920 feet below the confluence of Muddy and Rule Creek.
Drainage Area and Period of Record.--	196.08 sq. mi. The gage was established in the 1970's. It is unknown at this time how long the station was operated before it was abandoned. The station was reopened in the October of 2004.
Equipment.--	High data rate Sutron SatLink Logger DCP and Sutron Accububble mounted inside NEMA type boxes on steel posts on the north side of the Highway 101 bridge over Rule Creek. Primary reference gage is a wire weight gage on the Hwy 101 bridge over the channel on the downstream side. A crest gage captures instantaneous peaks via high water mark. No changes were made this water year.
Hydrologic Conditions.--	The Rule Creek gaging station has a drainage basin of approximately 364 square miles. Characteristics within the basin include rolling short-grass prairie rangelands with weeds and cacti. Livestock grazing exists in the watershed. Ephemeral or intermittent stream channels are common and these normally dry arroyos typically convey water as the result of convective storms that commonly occur during the late July through August summer monsoon. The influence of over grazing provides the largest affect to the runoff regime.
Gage-Height Record.--	Primary record is 15-minute satellite-monitored bubbler data with DCP log backup. Record is complete and reliable. Two missing unit values on August 25, 2011 were filled in from adjacent data without loss of accuracy. Primary stage sensor calibration to reference gage was supported by 6 site visits this water year, which were all zero flow measurements.
Datum Corrections.--	Levels were last run on July 19, 2007. No corrections were needed or made. An abbreviated level loop was run on July 30, 2007, to shoot in the RP for a wire weight reference gage.
Rating.--	Control is a downstream riffle which creates a small pool at the gage. At higher stages the control becomes the channel and includes the brush-lined riverbanks. Flows are contained by the bridge immediately upstream of the gage. Rating No. 2 was developed on May 17, 2010 and used for the entire water year. It is poorly defined due to a lack of discharge measurements. Six discharge measurements (Nos. 48-53) were made this water year all of which were zero flow observations. The peak discharge of 1410 cfs occurred at 0315 July 8, 2011 at a gage height of 5.84 ft with a shift of -0.96 ft. It exceeded the stage of Measurement No. 52 made at 1235 July 11, 2011 by 3.86 feet.
Discharge.--	Shifting control method was used for the entire water year. From the beginning of the water year to 0945 November 16, 2010 the shifts were prorated by time and supported by three-zero flow measurements during this period. Due to the nature of the control and point of zero flow variability, shifts were prorated to an event starting 0000 December 16, 2010 and ending 0000 April 24, 2011 to maintain PZF supported by measurement 51, gage height fluctuation, and comparison to Muddy creek discharge and rainfall data. Proration by time began at 1245 July 11, 2011. According to gage height data, the current shift was valid for the PZF up to the beginning of the flow event on 1200 August 3, 2011; therefore, shifts were prorated by event to this point. Due to the scour of the flood event, time proration was employed from 1215 August 3, 2011 to 2345 September 30, 2011.
Special Computations.--	Air temperature data was examined using Las Animas NOAA temperature data to assist with winter period ice formation on the gage pool. Discharge and precipitation data from the Muddy Creek near Toonerville gage upstream were used to assist with definition of flow periods.
Remarks.--	Record is poor for the entire water year, including estimated periods, due to the lack of rating definition and an estimated point of zero flow. The peak flow for the water year is also rated poor. The flashy nature and remote location of the gage make it extremely difficult to maintain a reliable stage-discharge relationship. Station maintained and record developed by Garrett Markus.
Recommendations.--	Run levels on the control cross section to better establish the point of zero flow.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

RULE CREEK AT HWY 101 NEAR TOONERVILLE, CO

RATING TABLE-- RULTOOCO002 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

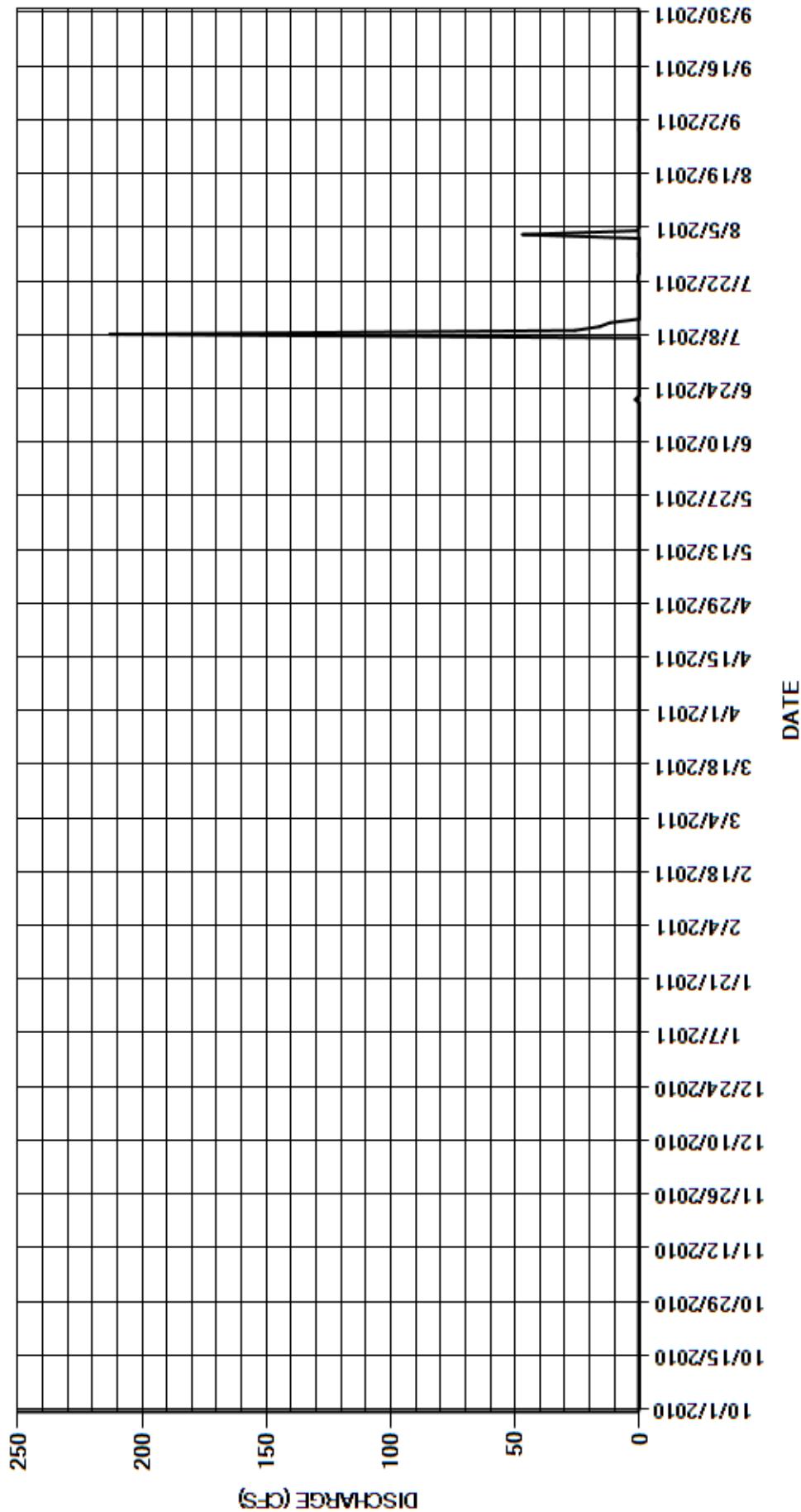
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	47	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	213	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.7	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.66	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.72	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.13	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.07	0.08	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	0.10	0.14	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.84	268.80	48.27	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.061	8.67	1.56	0.000
AC-FT	0	0	0	0	0	0	0	0	3.6	533	96	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.7	213	47	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAL YR	2010	TOTAL	11.85	MEAN	0.032	MAX	5.5	MIN	0.00	AC-FT	24	
WTR YR	2011	TOTAL	318.91	MEAN	0.87	MAX	213	MIN	0.00	AC-FT	633	

MAX DISCH: 1410 CFS AT 03:15 ON JUL 08,2011 GH 5.89 FT SHIFT -0.96 FT

MAX GH: 5.89 FT AT 03:15 ON JUL 08,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

RULE CREEK AT HWY 101 NEAR TOONERVILLE, CO
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
09061500 COLUMBINE DITCH NEAR FREMONT PASS
Water Year 2011

Location.--	Lat. 39°22'25", Long. 106°13'38". Columbine ditch diverts water from tributaries of Eagle River in sec. 5, T.8 S., R. 79 W., in Colorado River basin to Chalk Creek (tributary to East Fork Arkansas River) in NW¼ sec. 9, T.8 S., R 79 W., in Arkansas River basin.
Drainage Area and Period of Record.--	N/A
Equipment.--	Graphic water-stage recorder, satellite-monitored data collection platform (Sutron SatLink high data rate DCP) and shaft encoder in a 30-inch diameter metal pipe shelter and well. Shaft encoder and chart are set to outside staff gage. Control is a 6-foot steel Parshall flume.
Hydrologic Conditions.--	The Columbine Ditch is categorized a transmountain diversion structure which intercepts runoff from a drainage basin of approximately 1170 acres in the headwaters of the Eagle River basin and empties into Chalk Creek, a tributary of the east fork of the Arkansas River. The conveyance of water across the Continental Divide is accomplished through saddles which traverse the divide. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except for the occasional low volume trail road. No hydrologic condition changes were apparent this water year.
Gage-Height Record.--	The primary record is 15-minute satellite data with chart record and DCP log as backup. The record is complete and reliable. Diversion occurred this water year from 1145 Jun 27 through Jul 20, 2011.
Datum Corrections.--	Levels were last run on July 31, 2007. The gage was found to be reading within allowable limits, so no corrections were needed/taken. The level survey did confirm the floor of the flume slopes toward the staff gage.
Rating.--	Control is a 6-foot steel Parshall flume. A standard 6 ft. Parshall flume table (COLDITCO01, dated June 22, 1971) was used this water year. One discharge measurement (No. 85) at a flow of 9.01 cfs was made this water year along with one no flow observation at the start of operation on June 27, 2011. The measurement and observation of no flow covered the range in stage for the water year except for the higher daily flows of July 12, 18, 19 2011. The peak discharge of 39.7 cfs occurred at 1930 on July 18, 2011 at a gage height of 1.34 ft. with a shift of +0.03 ft. It exceeded Measurement 85 by 0.83 feet in stage.
Discharge.--	Measurements are made from a walkway across the flume at a position where the meter axis is even with the staff gage. Shifts were distributed by stage using a shift curve (COLDITCOVS09A) developed from current and previous water year measurements. This flume does have a considerable amount of lateral settling toward the staff gage and away from the inlet. This is the reasoning for the lower end of the shift curve as the stilling well very seldom drains and retains approximately 0.05 ft of gage height when there is no flow in the flume. Measurement 85 was adjusted by 3.33% for smoothing purposes in the variable shift curve.
Special Computations.--	Variable curve COLDITCOVS09A is considered a valid alternative for calculating flows. As noted above the flume has a considerable amount of lateral settling away from the gage house and inlet, this can be seen while measuring and when flume is empty. At 0.05 ft gage height and below there is no flow. This flume does appear to be stable from historical comments that agree with the current situation. Ice effect days were determined using chart data and air temperature data from Turquoise Lake. No ice effect was apparent this water year.
Remarks.--	There was a very short run of water this year. The new owner, Aurora/Freeport-McMoRan, operates the gage differently than the previous owner. For this water year the diverted flows were used for replacement of stream depletions caused by operations associated with Climax Mine. Flow patterns through the flume this water year differ than in previous water years. Hopefully this gage will have a more constant and predictable run of water to confirm the variable curve but unfortunately the operation of this gage made it very difficult to obtain multiple measurements for this WY. Record is rated good. The instantaneous peak discharge for the year is rated good based upon the site visit and measurement 6 days prior to that peak. Station maintained and record developed by Cheston Hart.
Recommendations.--	Depending on the future of this flume it is recommended the flume be reevaluated to either reinstall the flume or pour a false bottom in the flume to level the floor. Until that time, a new rating curve should be considered which incorporates values from the shift curve which is being used throughout the year.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09061500 COLUMBINE DITCH NEAR FREMONT PASS

RATING TABLE-- COLDITCO01 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.4	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.9	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.93	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.5	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.92	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.7	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.0	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.0	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.2	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.4	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.0	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.2	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.6	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.9	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.3	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.6	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.4	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	4.8	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	6.0	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.80	96.35	0.00	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.66	3.11	0.000	0.000
AC-FT	0	0	0	0	0	0	0	0	39	191	0	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.0	13	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

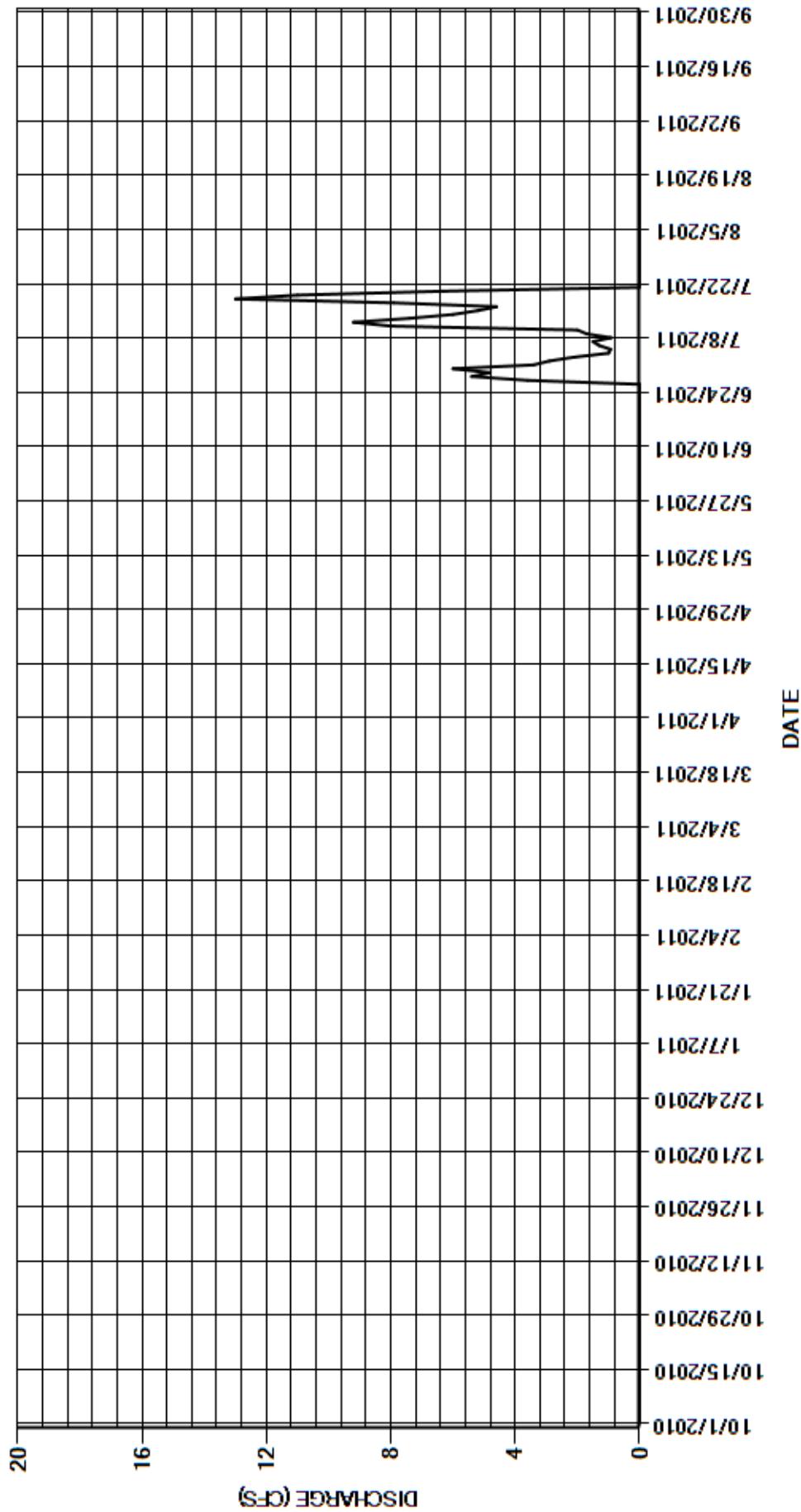
CAL YR	2010	TOTAL	177.65	MEAN	0.49	MAX	18	MIN	0.00	AC-FT	352
WTR YR	2011	TOTAL	116.15	MEAN	0.32	MAX	13	MIN	0.00	AC-FT	230

MAX DISCH: 39.7 CFS AT 19:30 ON JUL 18,2011 GH 1.34 FT SHIFT 0.03 FT

MAX GH: 1.34 FT AT 19:30 ON JUL 18,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09061500 COLUMBINE DITCH NEAR FREMONT PASS
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
09062000 EWING DITCH AT TENNESSEE PASS
Water Year 2011

Location.--	Lat. 39°21'40", Long. 106°18'22", diverts water from Piney Creek in sec. 11, T.8 S., R.80 W., in Eagle River basin, to Thayer Gulch (tributary to Tennessee Creek) in Sec. 11, T. 8 S., R.80 W., in Arkansas River basin.
Drainage Area and Period of Record.--	N/A
Equipment.--	Graphic water-stage recorder, satellite-monitored data collection platform (Sutron SatLink high data rate DCP and logger) and shaft encoder in a 30-inch diameter metal pipe shelter and well. Shaft encoder and chart are set to outside staff gage. Control is a 4-foot steel Parshall flume. No changes this water year.
Hydrologic Conditions.--	The Ewing Ditch diverts water from the headwaters of Piney Creek, a tributary of the Eagle River, over Tennessee Pass at an elevation of 10,500 feet, and into the headwaters of Tennessee Creek, a tributary of the Arkansas River. The basin consists primarily of high mountain terrain with very little development. The ditch is approximately 1.5 miles long, and intercepts runoff from a drainage area of 2,400 acres. No hydrologic condition changes were apparent this water year.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup. The record is complete and reliable, except for May 20, 21, 24, and 26 when the gage height was affected by ice. Diversion this water year occurred October 1-12, 2010 and from 0800 May 14 to 1030 Sept 15, 2011. During the latter period satellite equipment was not turned on until 1000 May 16. Backup chart recorder data were used to fill in missing data without loss of accuracy.
Datum Corrections.--	Levels were last run on July 11, 2006. The gage was found to be reading within established tolerance and no datum corrections were made.
Rating.--	Control is a 4-foot steel Parshall flume. A standard 4-ft. Parshall flume table (STD04FTPF dated June 22, 1971) was used this water year. Three discharge measurements (No. 108-110) were made during the year, ranging in discharge from 1.19 to 14.6 cfs. They cover the range in stage except higher flow days of June 6-27, 2011 and lower flow days of Oct 1-12, 2010; May 14, 20-22, 24, 25; Aug 31; Sept 1-15, 2011. The peak discharge of 21.1 cfs occurred at 1730 on June 7, 2011 at a gage height of 1.22 ft with a shift of -0.03 ft. It exceeded the stage of Measurement 108 by 0.25 feet in stage.
Discharge.--	Measurements are made from a walkway across the flume at a position where the meter axis is even with the staff gage. Shifts were distributed by stage using shift curve EWIDITCOVS09 developed from current and previous water year measurements. Measurements made this WY show shifts ranging from -0.03 ft to -0.04 ft. Measurements 108 and 109 were discounted 1.35% and 3.23%, respectively, for smoothing purposes in the variable shift curve.
Special Computations.--	Variable stage shift relationship EWIDITCOVS09 is considered a valid adjustment to the standard table for calculating flows at this flume. Flows on ice affected days were estimated using trends in good record before and after ice effect and by cutting off the daily ice spikes. There are no available gages to use for comparison.
Remarks.--	Record is considered good, except for periods of ice effect, which are estimated and poor. The instantaneous peak discharge is rated good given that a discharge measurement was completed on the next day with no anomalies noted. Station maintained and record developed by Cheston Hart.
Recommendations.--	Recommend measuring throughout the running water season to establish a better range in stage. A flume inspection should be performed in WY2012. A custom rating curve should be considered which incorporates the values from the shift curve which is being used throughout the year.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09062000 EWING DITCH AT TENNESSEE PASS

RATING TABLE-- STD04FTP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

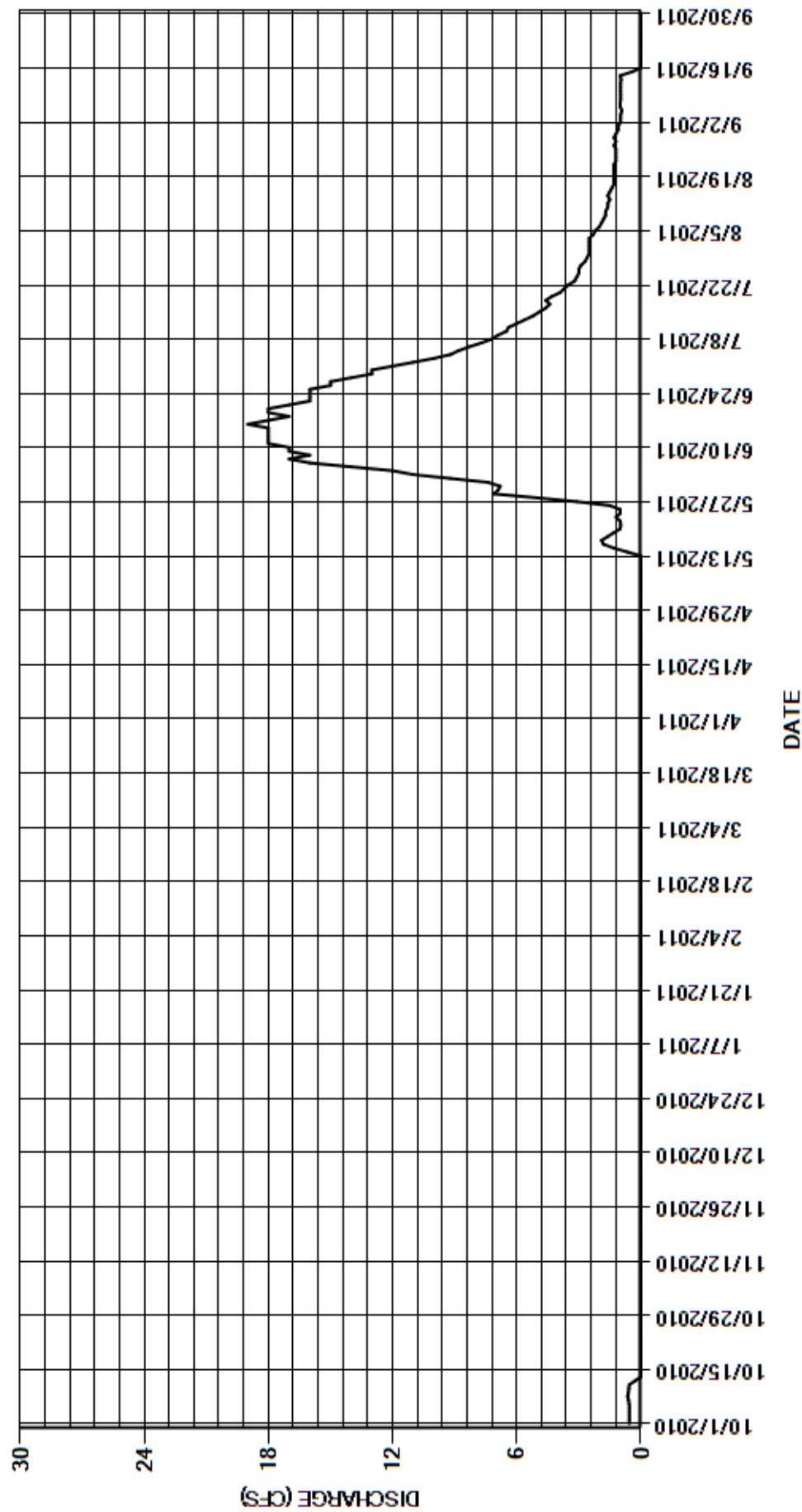
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.4	12	2.5	1.1
2	0.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.2	11	2.5	0.98
3	0.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11	10	2.5	0.98
4	0.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12	9.2	2.3	0.97
5	0.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14	8.8	2.2	0.92
6	0.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16	8.3	2.0	1.0
7	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17	7.7	1.9	1.0
8	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16	7.2	1.8	0.97
9	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17	6.9	1.7	0.97
10	0.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17	6.5	1.7	0.98
11	0.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18	6.4	1.6	0.98
12	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18	6.0	1.6	0.98
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18	5.6	1.5	0.96
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	18	5.2	1.6	1.0
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	18	4.9	1.5	0.42
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.8	19	4.6	1.4	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.9	18	4.4	1.3	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.6	17	4.6	1.3	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	18	4.3	1.3	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e1.0	18	3.9	1.3	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e0.97	17	3.7	1.3	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	16	3.5	1.3	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.2	16	3.2	1.2	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e1.0	16	3.1	1.2	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	16	3.0	1.2	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e1.5	15	3.0	1.2	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.1	15	2.9	1.3	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.0	14	2.7	1.2	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	7.1	13	2.6	1.3	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	6.9	13	2.5	1.2	0.00
31	0.00	---	0.00	0.00	---	0.00	---	6.8	---	2.5	1.1	---
TOTAL	6.62	0.00	0.00	0.00	0.00	0.00	0.00	45.12	467.6	170.2	49.0	14.21
MEAN	0.21	0.000	0.000	0.000	0.000	0.000	0.000	1.46	15.6	5.49	1.58	0.47
AC-FT	13	0	0	0	0	0	0	89	927	338	97	28
MAX	0.64	0.00	0.00	0.00	0.00	0.00	0.00	7.1	19	12	2.5	1.1
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.4	2.5	1.1	0.00
CAL YR	2010	TOTAL	469.77	MEAN	1.29	MAX	11	MIN	0.00	AC-FT	932	
WTR YR	2011	TOTAL	752.75	MEAN	2.06	MAX	19	MIN	0.00	AC-FT	1490	

MAX DISCH: 21.1 CFS AT 17:30 ON JUN 07,2011 GH 1.22 FT SHIFT -0.03 FT

MAX GH: 1.22 FT AT 17:30 ON JUN 07,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09062000 EWING DITCH AT TENNESSEE PASS
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
09062500 WURTZ DITCH NEAR TENNESSEE PASS
Water Year 2011

Location.--	Lat. 39°21'15", Long. 106°21'09"; diverts water from tributaries of Eagle River in Colorado River basin to West Tennessee Creek (tributary to Tennessee Creek) in sec. 17, T.8 S., R.80 W., in Arkansas River basin.
Drainage Area and Period of Record.--	5840 acres
Equipment.--	Graphic water-stage recorder, satellite-monitored data collection platform (Sutron SatLink high data rate DCP and logger) and shaft encoder in a 30-inch diameter metal pipe shelter and well. Shaft encoder and chart are set to outside staff gage which was relocated to the correct location in WY2010. Control is a 6-foot steel Parshall flume.
Hydrologic Conditions.--	The Wurtz Ditch, in combination with the Wurtz Ditch Extension, are categorized as transmountain diversion structures which intercept runoff from a drainage basin of approximately 5840 acres in the headwaters of the Eagle River basin and empties into West Tennessee Creek, a tributary of the Arkansas River. The conveyance of water across the Continental Divide is accomplished through saddles which traverse the divide. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except for the occasional low volume trail road. No hydrologic condition changes were apparent this water year.
Gage-Height Record.--	The primary record is 15-minute satellite data with chart record and DCP log as backup. The record is complete and reliable. Diversions this water year occurred from May 25 through July 14 2011.
Datum Corrections.--	Levels were last run Sept 23, 2008. Some unevenness along the flume floor at the staff gage along with upstream apron elevation were noted.
Rating.--	Control is a 6-foot steel Parshall flume. A standard 6-ft. Parshall flume table (WURDITCO01 dated June 22, 1971) was used this water year. Two discharge measurements (Nos.101-102) were made during this water year. Measurements ranged in discharge from 18.4 to 34.1 cfs. These measurements cover the range of stage experienced for the water year except for lower flows of May 25-31, June 1, 6-7, 2011 and higher flows of June 4, 9-31, July 1-3, 2011. The peak discharge of 73.7 cfs occurred at 1915 on June 17, 2011 at a gage height of 1.98 ft with a shift of +0.04 ft. It exceeded the stage of measurement 101, made June 15, 2011, by 0.77 feet.
Discharge.--	Measurements are made in the flume at the staff gage. Shifts were distributed using variable stage shift relationship WURDITCOVS10 which was developed by analysis of current and historical measurements. Measurements made this water year show shifts ranging from 0.03 ft to 0.04 ft.
Special Computations.--	The upstream hydrograph from WUREXTCO was used to verify trends.
Remarks.--	Record is considered good. The peak instantaneous discharge is rated good due to a hydrographic measurement two days prior with no anomalies noted. Station maintained and record developed by Cheston Hart.
Recommendations.--	A new rating curve should be considered which incorporates values from the variable shift curve being used.

STATE OF COLORADO
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09062500 WURTZ DITCH NEAR TENNESSEE PASS

RATING TABLE-- WURDITCO01 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

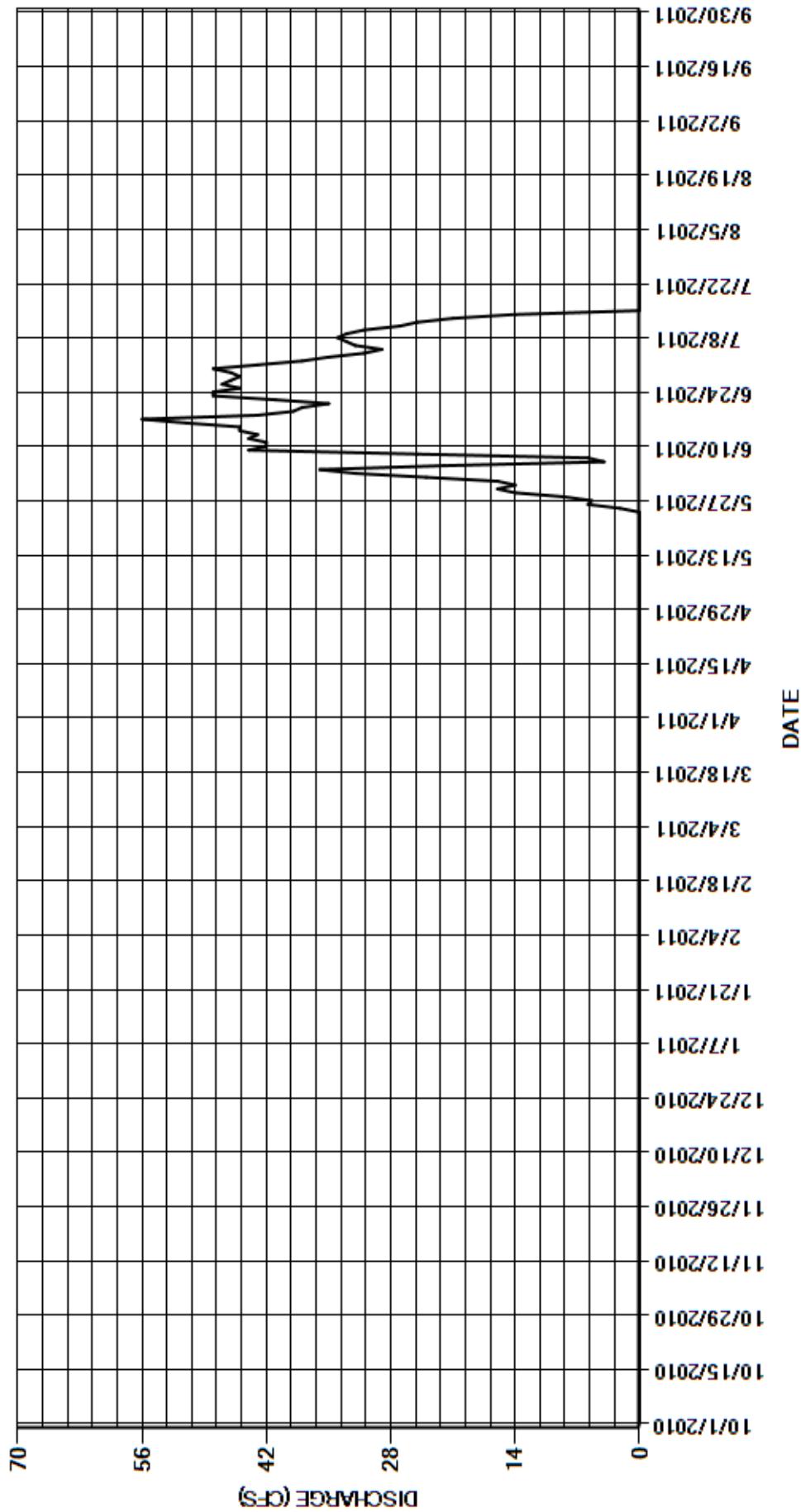
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16	43	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24	38	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32	35	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36	31	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22	29	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.0	32	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.8	33	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25	34	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	44	33	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	42	31	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	42	27	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	44	25	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	43	21	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	45	14	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	45	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	51	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	56	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	43	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	39	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	38	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	48	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	48	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.2	45	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.8	47	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.4	46	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.6	45	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	14	46	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	16	48	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	0.00	---	14	---	0.00	0.00
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	66.00	1145.8	426.00	0.00	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.13	38.2	13.7	0.000	0.000
AC-FT	0	0	0	0	0	0	0	131	2270	845	0	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16	56	43	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.0	0.00	0.00	0.00
CAL YR	2010	TOTAL	852.20	MEAN	2.33	MAX	55	MIN	0.00	AC-FT	1690	
WTR YR	2011	TOTAL	1637.80	MEAN	4.49	MAX	56	MIN	0.00	AC-FT	3250	

MAX DISCH: 73.7 CFS AT 19:15 ON JUN 17,2011 GH 1.98 FT SHIFT 0.04 FT

MAX GH: 1.98 FT AT 19:15 ON JUN 17,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09062500 WURTZ DITCH NEAR TENNESSEE PASS
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN

WURTZ EXTENSION

Water Year 2011

Location.--	Lat. 39°23'41", Long. 106°21'10", sec. 32, T.7 S., R.80 W., Eagle County.
Drainage Area and Period of Record.--	5840 acres.
Equipment.--	Graphic water-stage recorder, Sutron high data rate SatLink Logger DCP satellite-monitored data collection platform and shaft encoder in a 30-inch diameter metal pipe shelter and well. Shaft encoder and chart are set to outside staff gage. Control is a 6-foot, steel Parshall flume. No changes this water year.
Hydrologic Conditions.--	The Wurtz Extension Ditch, in combination with the Wurtz Ditch, are categorized as transmountain diversion structures which intercept runoff from a drainage basin of approximately 5840 acres in the headwaters of the Eagle River basin and empties into West Tennessee Creek, a tributary of the Arkansas River. The conveyance of water across the Continental Divide is accomplished through saddles which traverse the divide. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except for the occasional low volume trail road. No hydrologic condition changes were apparent this water year.
Gage-Height Record.--	Primary record is 15-minute satellite data with chart record and DCP log as backup. The record is complete and reliable. Diversion occurred from June 2 through July 21, 2011.
Datum Corrections.--	No levels were run this year, previous levels were run September 23, 2008. No datum corrections were necessary. Some unevenness along the flume floor and the position of the outside staff gage were noted.
Rating.--	Control is a 6-foot, steel Parshall flume. A standard, 6-ft Parshall flume rating table (WUREXDCO01 dated June 22, 1971) was used this water year. One discharge measurement (No. 34) was made this year with a discharge of 17.6 cfs at a gage height of 0.84 ft. This measurement reflects the upper end of the stage and discharge experienced during the water year, except for higher average daily flows of June 13-20, 2011. The peak flow of 27.9 cfs occurred at 1830 June 17, 2011 at a gage height of 1.11 ft. with a shift of -0.01 ft. It exceeded the stage of Measurement No. 34, made June 15, 2011, by 0.27 ft.
Discharge.--	Measurements are made in the flume at the staff gage. Shifts were distributed using variable stage-shift relationship WUREXTCOVSC010 which was developed by analysis of current and historical measurements. Measurement 34 showed a shift of -0.02 ft and was discounted by -1.12% to fit the variable shift curve.
Special Computations.--	No special computations were needed this water year.
Remarks.--	Overall the record is considered good. The peak is also considered good based upon the site visit and measurement 2 days prior to the peak and all flow being contained within the confines of the Parshall flume. Station maintained and record developed by Cheston Hart.
Recommendations.--	A flume inspection should be performed to confirm the staff gage location and floor elevations. Depending on the need for flume repairs or replacement, a new rating curve should be considered which incorporates values from the variable shift curve which is being used.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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WURTZ EXTENSION

RATING TABLE-- WUREXDCO01 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.4	10	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.6	9.5	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.0	8.6	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.0	8.3	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.5	9.0	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.3	10	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.6	9.5	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16	8.6	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16	7.4	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17	6.8	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17	6.1	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18	5.4	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18	3.9	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	0.43	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21	0.40	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23	0.32	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20	0.34	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19	0.36	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18	0.25	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16	0.12	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	14	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	14	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	404.40	117.32	0.00	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	13.5	3.78	0.000	0.000
AC-FT	0	0	0	0	0	0	0	0	802	233	0	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23	12	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

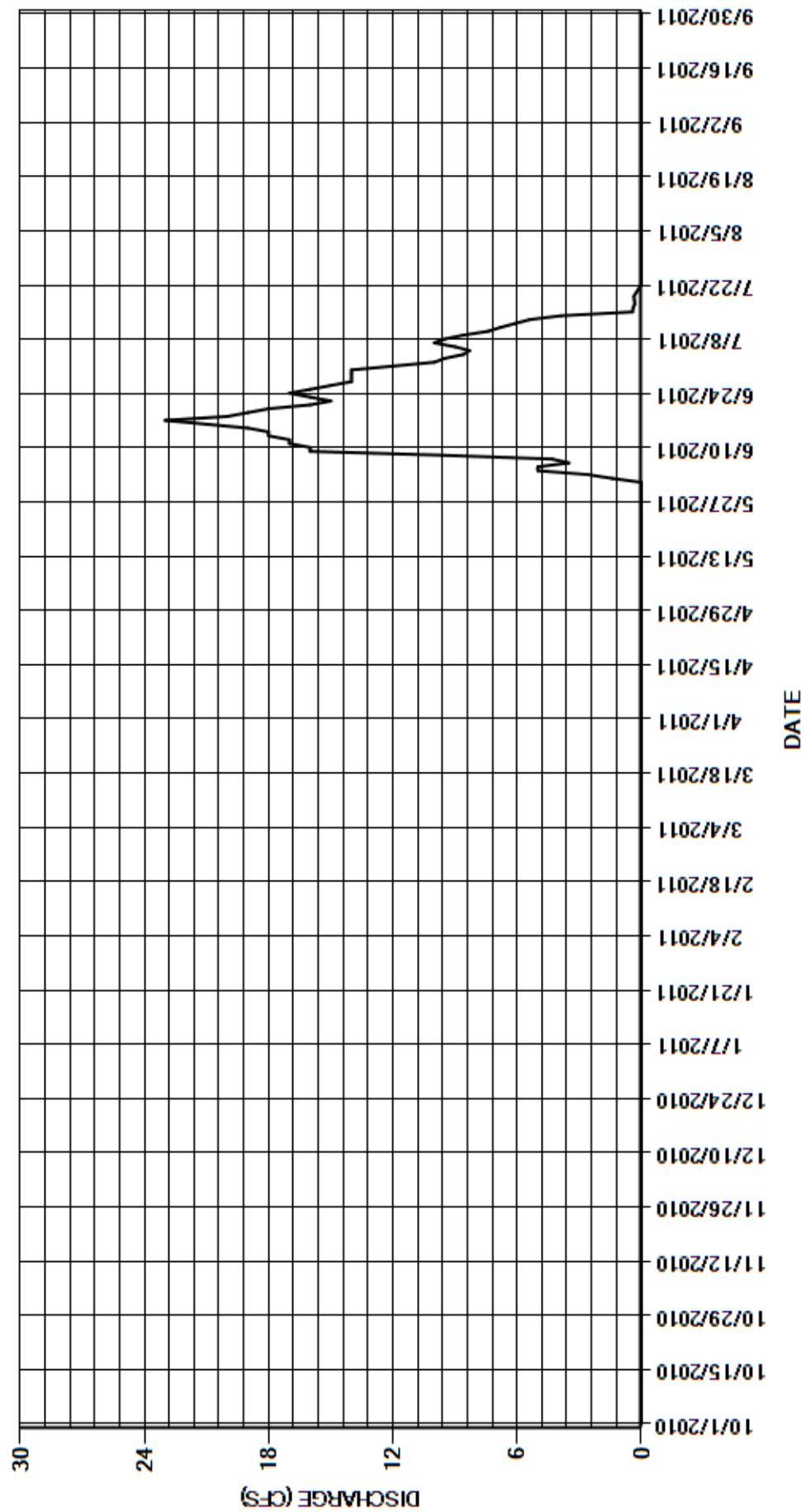
CAL YR	2010	TOTAL	188.42	MEAN	0.52	MAX	13	MIN	0.00	AC-FT	374
WTR YR	2011	TOTAL	521.72	MEAN	1.43	MAX	23	MIN	0.00	AC-FT	1030

MAX DISCH: 27.9 CFS AT 18:30 ON JUN 17,2011 GH 1.11 FT SHIFT -0.01 FT

MAX GH: 1.11 FT AT 18:30 ON JUN 17,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

WURTZ EXTENSION
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
09063700 HOMESTAKE TUNNEL
Water Year 2011

Location.--	Lat. 39°16'52", Long. 106°25'56"; Homestake tunnel diverts water from Homestake Lake, in sec. 17, T. 8 S., R. 81 W., in Eagle River basin, to Lake Fork Creek in Arkansas River basin.
Drainage Area and Period of Record.--	N/A.
Equipment.--	Graphic water-stage recorder, high-data rate satellite-monitored data collection platform (DCP) and shaft encoder in a 4 ft x 4 ft wood shelter and concrete well. Shaft encoder and chart are set to inside electric tape gage and outside staff gage. Control is a 12-foot concrete Parshall flume. On April 7, 2011, the backup chart recorder was replaced with an SDR. No other changes in equipment this water year.
Hydrologic Conditions.--	The Homestake Project is categorized as a transmountain diversion structure that collects water from the headwaters of the Eagle River, northwest of Leadville. Water is diverted from several tributaries of Homestake Creek and routed to Homestake Reservoir. Diversions then pass from the reservoir through the Homestake Tunnel to Lake Fork Creek, above Turquoise Reservoir. The collection basin consists primarily of high mountain terrain, some of which is above tree line with no urban development. No hydrologic condition changes were apparent this water year.
Gage-Height Record.--	The primary record is 15-minute satellite data with the graphic chart recorder and SDR used for backup purposes. The record is complete and reliable for the seasonally operated gage except for occasional missing data throughout the discharge period which was replaced with backup data or linear interpolation without loss of accuracy.
Datum Corrections.--	Levels were last run on July 11, 2006.
Rating.--	A standard 12-ft. Parshall flume rating table (HOMTUNCO01 dated June 11, 1975) was used the entire water year. Three discharge measurements (No. 120-122) were made this year with measured discharges ranging from 100 cfs to 213 cfs. Daily flows varied during the water year from zero to 269 cfs. The instantaneous peak discharge of 271 cfs occurred at 1145 on April 18, 2011 at a gage height of 2.91 ft and a shift of +0.09 ft. This peak exceeded the stage of the maximum Measurement No. 120 by 0.45 feet.
Discharge.--	Measurements are made from a bridge near the intake/staff gage position. Shifts were applied as defined by measurements and were distributed by stage using variable stage-shift relationship HOMTUNCOVS09, utilized during the water year and developed using past measurement data. WY2011 measurements showed shifts ranging from +0.09 to +0.12 ft. Measurements 120 and 121 were adjusted by 0.95% and 1.00%, respectively, to fit the variable shift curve. Subsequent measurements will continue to reinforce the direction of the curve.
Special Computations.--	Variable stage-shift relationship HOMTUNCOVS09 is considered a valid adjustment to the standard rating curve for calculating flows. No other special computations were used this water year.
Remarks.--	Record is considered good, however most measurements are rated fair to poor given the surging effect of flows from the tunnel and through the flume. ADCP measurements were attempted but not possible at current measurement location. The peak gage height and flow are considered fair due to the surging effect. Station maintained and record developed by Cheston Hart.
Recommendations.--	More research should be attempted to reduce the surge effect. If at all possible new radar technology could be used to find if there are drawdown effects of the well caused by the high velocity flume conditions. A level survey should be completed in the next water year. The standard rating curve needs to be updated to reflect the use of a variable shift curve year round.

STATE OF COLORADO
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09063700 HOMESTAKE TUNNEL

RATING TABLE-- HOMTUNCO01 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

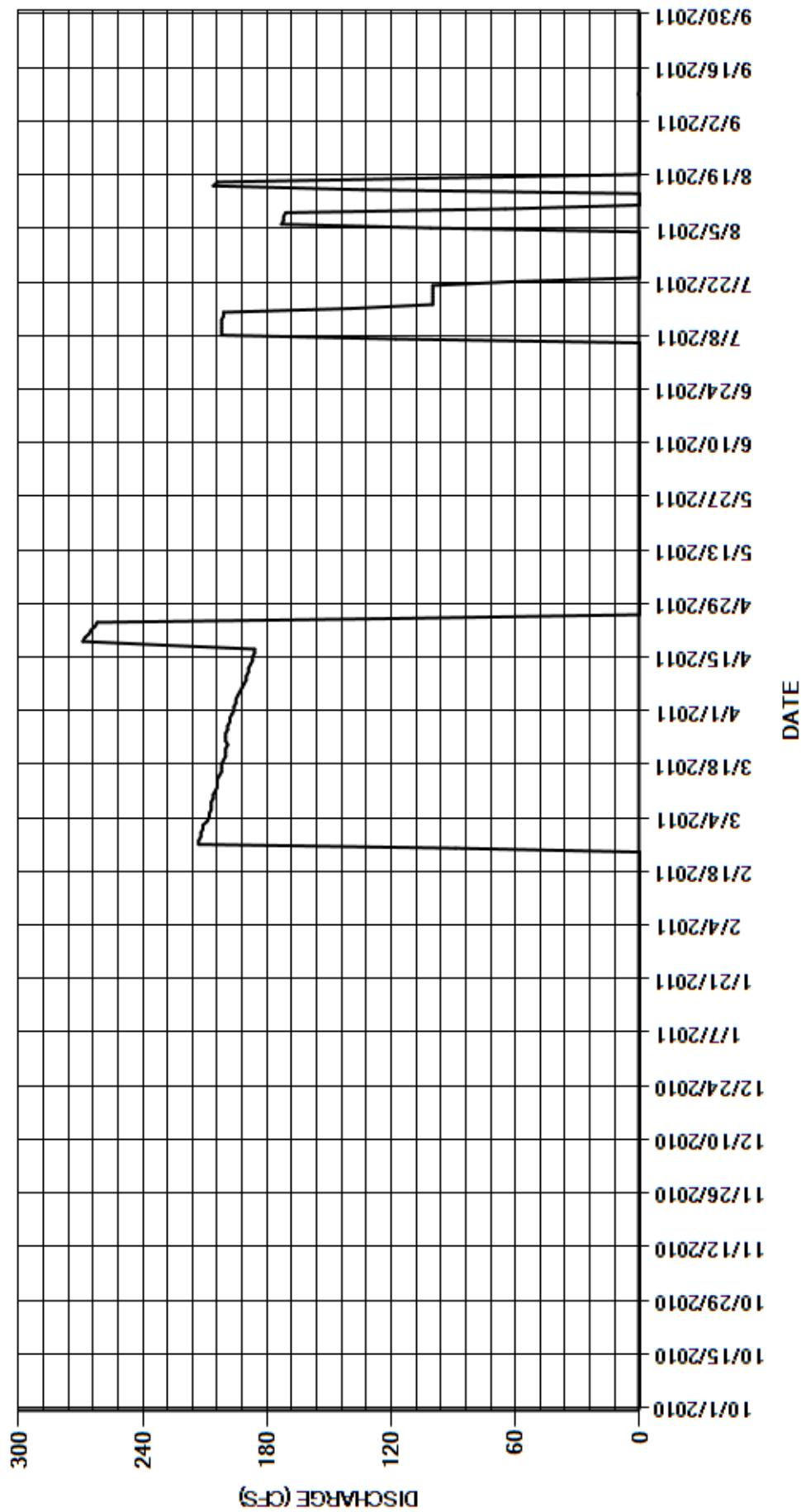
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	211	196	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	211	196	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	209	195	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	208	195	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	208	194	0.00	0.00	e0.00	101	0.00
6	0.00	0.00	0.00	0.00	0.00	207	193	0.00	0.00	e0.00	173	0.00
7	0.00	0.00	0.00	0.00	0.00	207	192	0.00	0.00	118	172	e0.00
8	0.00	0.00	0.00	0.00	0.00	207	191	0.00	0.00	202	172	0.00
9	0.00	0.00	0.00	0.00	0.00	206	190	0.00	0.00	202	171	0.48
10	0.00	0.00	0.00	0.00	0.00	206	190	0.00	0.00	202	65	0.00
11	0.00	0.00	0.00	0.00	0.00	205	189	0.00	0.00	202	0.02	0.00
12	0.00	0.00	0.00	0.00	0.00	204	189	0.00	0.00	202	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	204	188	0.00	0.00	201	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	204	187	0.00	0.00	201	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	203	187	0.00	0.00	139	134	0.00
16	0.00	0.00	0.00	0.00	0.00	202	186	0.00	0.00	100	206	0.00
17	0.00	0.00	0.00	0.00	0.00	202	186	0.00	0.00	100	204	0.00
18	0.00	0.00	0.00	0.00	0.00	202	229	0.00	0.00	100	103	0.00
19	0.00	0.00	0.00	0.00	0.00	201	269	0.00	0.00	100	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	200	268	0.00	0.00	100	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	200	266	0.00	0.00	100	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	200	265	0.00	0.00	61	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	199	263	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	89	200	262	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	213	200	119	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	213	200	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	212	199	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	212	199	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	198	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	198	0.00	0.00	e0.00	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	197	---	0.00	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	939.00	6297	5185.00	0.00	0.00	2330.00	1501.02	0.48
MEAN	0.000	0.000	0.000	0.000	33.5	203	173	0.000	0.000	75.2	48.4	0.016
AC-FT	0	0	0	0	1860	12490	10280	0	0	4620	2980	1.0
MAX	0.00	0.00	0.00	0.00	213	211	269	0.00	0.00	202	206	0.48
MIN	0.00	0.00	0.00	0.00	0.00	197	0.00	0.00	0.00	0.00	0.00	0.00
CAL YR	2010	TOTAL	4543.00	MEAN	12.4	MAX	285	MIN	0.00	AC-FT	9010	
WTR YR	2011	TOTAL	16252.50	MEAN	44.5	MAX	269	MIN	0.00	AC-FT	32240	

MAX DISCH: 271 CFS AT 11:45 ON APR 18,2011 GH 2.91 FT SHIFT 0.09 FT

MAX GH: 2.91 FT AT 11:45 ON APR 18,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09063700 HOMESTAKE TUNNEL
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
09077500 BUSK-IVANHOE TUNNEL
Water Year 2011

Location.--	Lat. 39°14'55", Long. 106°28'14"; Water diverted from Ivanhoe Lake, tributary to Fryingpan River in sec. 13, T. 9 S., R. 82 W., in Roaring Fork River Basin, to Busk Creek (tributary to Lake Fork) in sec. 20, T. 9 S., R. 81 W., in Arkansas River Basin.
Drainage Area and Period of Record.--	N/A
Equipment.--	Graphic water-stage recorder, satellite-monitored data collection platform (Sutron SatLink high data rate DCP and logger) and shaft encoder in a 3 ft x 3 ft metal shelter and well. Shaft encoder and chart recorder are set to outside staff gage. Control is a 5-foot steel Parshall flume. The flume and well house are new as of 10/12/2009. No changes this water year.
Hydrologic Conditions.--	The Busk-Ivanhoe Tunnel (a.k.a. the Carlton Tunnel) was originally built as a railroad tunnel. The tunnel diverts water from the headwaters of Ivanhoe Creek, a tributary of the Fryingpan River. The Tunnel is 1.3 miles long and delivers the water to Busk Creek, which is tributary to the Turquoise Reservoir of the Arkansas River Basin. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except for the occasional low volume trail road. No hydraulic condition changes were apparent this water year.
Gage-Height Record.--	The primary record is 15-minute satellite data with chart record and DCP log as backup. Record is complete and reliable, except for the period November 24-30, 2010 when the stilling well was frozen. There were several large offsetting instrument calibration corrections (+0.07, -0.10, +0.10, and -0.08 ft) applied to the record during the high flow period from late May to late July. Poor approach conditions are suspected to be the reason for the multiple corrections found this year. Once high water was completed flume conditions were inspected and excessive fill directly in front of the apron was found, causing most of the flow to be at the banks. This increased velocity at the edges caused unpredictable waves contributing to the instrument corrections during the run off periods. There were 4 missing unit values on July 13. Missing data was replaced by linearly interpolating between adjacent good data with no loss of accuracy since the gage heights were fairly constant in this period.
Datum Corrections.--	Levels were not run this year.
Rating.--	A standard 5-ft. Parshall flume table (STD05FTP09) was used the entire water year. Four discharge measurements (Nos. 108-111), ranging in discharge from 0.62 to 48 cfs, were made during the year. They covered the range in flows except for the lower daily flows of December 11, 2010 and September 28-30, 2011; and the higher mean daily flows of June 24-27, 2011. The peak discharge of 50.4 cfs occurred at 0900 on June 25, 2011 at a gage height of 1.80 ft with a shift of -0.01 ft. The peak exceeded the stage of high flow measurement 110, made June 27, 2011 by 0.02 feet.
Discharge.--	Shifting control method was used all year. Shifts were distributed by time the entire year. Measurements show shifts ranging from 0.00 to -0.02 ft.
Special Computations.--	Mean daily discharge during the period November 24-30, 2010 when the stilling well froze was estimated by linearly interpolating adjacent good data.
Remarks.--	Gage is operated during the winter months without a chart. The site is visited by Pueblo Board of Water Works staff by snow machine during the months that the gage is not accessible by vehicle. The gage remains ice free by running a 1-inch water line from the tunnel directly into the well. The flume inlet is 2-in diameter, which allows a constant flow through the inlet and helps keep the well thawed and accurate. Overall the record is considered good, except for the winter operation months of October thru June 24th and those are considered poor. The peak gage height and discharge are also considered good since a field measurement was made 2 days after the peak event with no significant change in shift. Due to the excessive snow fall this year the gage was not accessed by vehicle until June 24, 2011. Station maintained and record developed by Cheston Hart.
Recommendations.--	Approach conditions need to be improved so the Parshall flume can be operated in a more predictable manner. A complete flume inspection needs to be completed as soon as possible.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09077500 BUSK-IVANHOE TUNNEL

RATING TABLE-- STD05FTP09 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

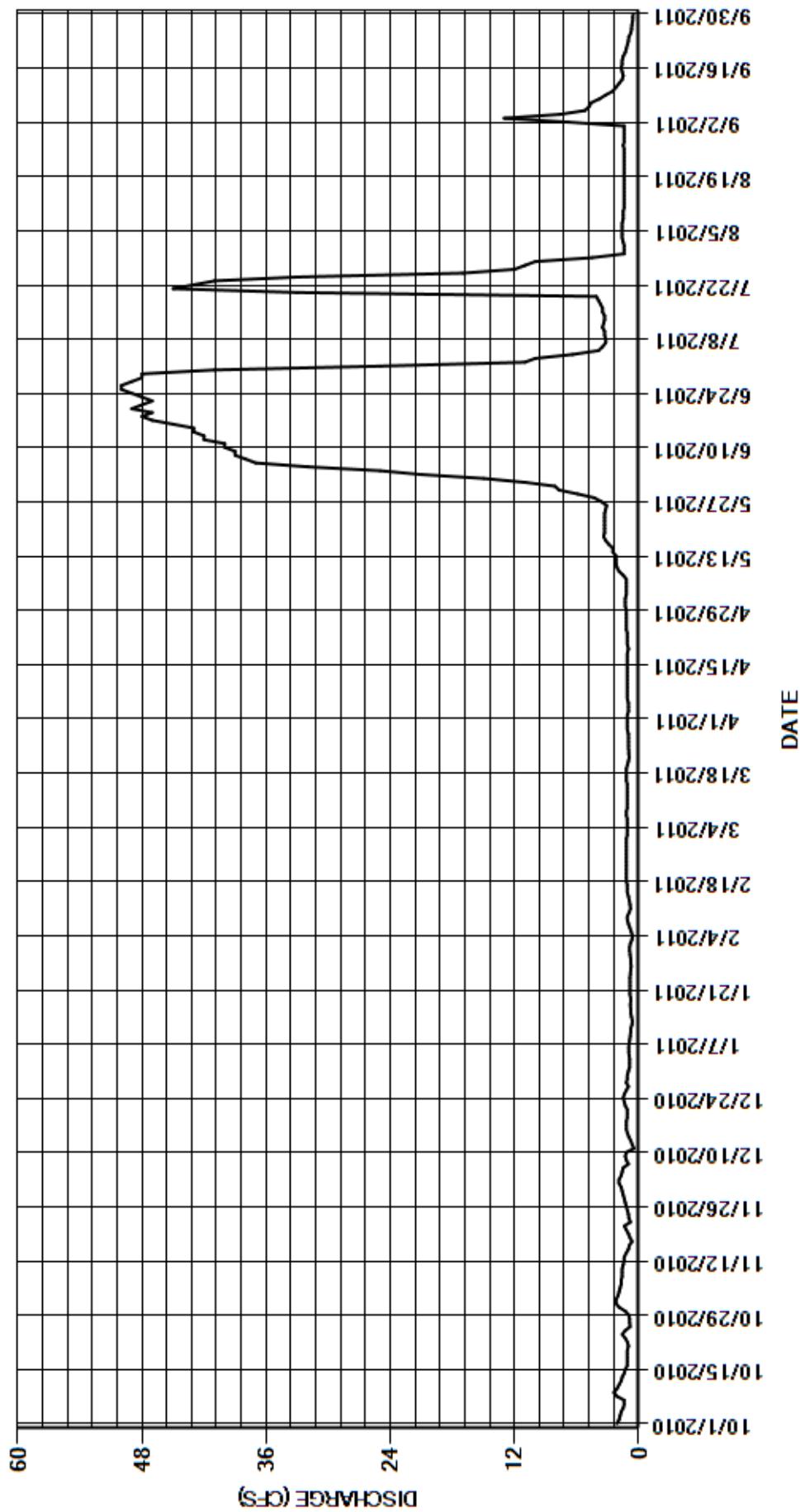
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.1	2.2	1.7	0.88	0.88	1.2	1.1	1.3	11	25	1.4	1.4
2	1.9	2.2	1.9	0.88	0.80	1.1	1.1	1.3	15	11	1.5	6.8
3	1.8	2.0	1.9	0.88	0.65	1.1	0.98	1.2	21	10	1.6	13
4	1.7	1.9	1.7	0.93	0.62	1.1	0.99	1.2	25	6.4	1.6	7.6
5	1.5	1.8	1.6	0.96	0.73	1.1	1.0	1.2	32	3.9	1.6	5.2
6	1.4	1.7	1.5	0.98	0.86	1.1	1.1	1.2	37	3.5	1.6	4.8
7	1.4	1.7	1.0	0.93	1.0	1.2	1.1	1.2	38	3.2	1.6	4.6
8	2.1	1.6	1.2	0.88	1.1	1.2	1.1	1.5	39	3.2	1.5	3.8
9	2.4	1.6	1.3	0.82	1.1	1.1	1.1	1.9	39	3.3	1.5	3.2
10	2.1	1.6	1.2	0.78	0.91	1.1	1.1	2.1	40	3.3	1.5	2.5
11	1.9	1.5	0.47	0.78	0.79	1.1	1.1	2.2	40	3.5	1.4	2.2
12	1.7	1.4	0.63	0.65	0.85	1.1	1.1	2.2	42	3.4	1.4	1.9
13	1.6	1.4	0.77	0.62	0.91	1.1	1.1	2.2	42	3.3	1.4	1.6
14	1.4	1.2	0.96	0.70	0.99	1.1	1.1	2.5	43	3.3	1.4	1.5
15	1.3	1.0	1.1	0.79	1.1	1.1	1.1	2.5	43	3.5	1.4	1.6
16	1.1	0.90	1.2	0.78	1.1	1.2	1.1	2.9	45	3.5	1.4	1.7
17	1.1	0.65	1.2	0.81	1.1	1.2	1.1	3.2	47	3.7	1.4	1.6
18	1.1	0.86	1.2	0.78	1.2	1.2	1.1	3.4	48	3.9	1.4	1.6
19	1.1	1.0	1.1	0.79	1.2	1.2	1.0	3.3	47	4.1	1.4	1.5
20	1.1	1.2	1.1	0.87	1.2	1.1	1.1	3.3	49	33	1.4	1.3
21	1.0	1.4	1.1	0.84	1.2	1.0	1.1	3.3	48	45	1.4	1.2
22	1.1	0.80	1.3	0.84	1.2	0.92	1.1	3.3	47	43	1.4	1.1
23	1.3	0.95	1.4	0.84	1.2	0.97	1.1	3.3	48	41	1.4	1.0
24	1.6	e1.0	1.5	0.86	1.2	0.98	1.2	3.3	49	33	1.4	0.96
25	1.3	e1.1	1.4	0.81	1.2	0.98	1.2	3.2	50	17	1.4	0.78
26	0.83	e1.2	1.2	0.78	1.2	0.98	1.2	3.1	50	12	1.4	0.69
27	0.88	e1.3	1.0	0.74	1.2	0.98	1.2	3.6	49	11	1.5	0.67
28	0.88	e1.4	1.2	0.76	1.2	1.0	1.2	4.3	48	10	1.4	0.60
29	0.97	e1.5	1.1	0.78	---	1.1	1.2	5.9	48	4.5	1.4	0.57
30	1.3	e1.6	1.1	0.84	---	1.1	1.3	7.7	41	1.4	1.4	0.55
31	1.9	---	1.0	0.88	---	1.1	---	8.1	---	1.4	1.4	---
TOTAL	44.86	41.66	38.03	25.46	28.69	33.81	33.37	90.9	1221	357.3	44.9	77.52
MEAN	1.45	1.39	1.23	0.82	1.02	1.09	1.11	2.93	40.7	11.5	1.45	2.58
AC-FT	89	83	75	50	57	67	66	180	2420	709	89	154
MAX	2.4	2.2	1.9	0.98	1.2	1.2	1.3	8.1	50	45	1.6	13
MIN	0.83	0.65	0.47	0.62	0.62	0.92	0.98	1.2	11	1.4	1.4	0.55
CAL YR	2010	TOTAL	1670.55	MEAN	4.58	MAX	46	MIN	0.35	AC-FT	3310	
WTR YR	2011	TOTAL	2037.50	MEAN	5.58	MAX	50	MIN	0.47	AC-FT	4040	

MAX DISCH: 50.4 CFS AT 09:00 ON JUN 25,2011 GH 1.80 FT SHIFT -0.01 FT

MAX GH: 1.80 FT AT 09:00 ON JUN 25,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09077500 BUSK-IVANHOE TUNNEL
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
09077160 CHARLES H. BOUSTEAD TUNNEL
Water Year 2011

Location.--	Lat. 39°16'40", Long. 106°25'40"; Charles H. Boustead Tunnel diverts water from the main stem and tributaries of the Fryingpan River in the Colorado River basin, to Lake Fork Creek in sec. 10, T. 9 S., R. 81 W., in the Arkansas River basin.
Drainage Area and Period of Record.--	N/A
Equipment.--	Shaft encoder and satellite-monitored data collection platform (Sutron Satlink 2 DCP) and stage discharge recorder (SDR) in a 5'X5' concrete shelter and well at a 15-foot concrete Parshall Flume. The SE/SDR are set to inside electric tape gage. Outside staff gage used for supplemental reference gage. Bridge across concrete section at the entrance to the converging section of the flume is used for making high water cable measurements. No changes this water year.
Hydrologic Conditions.--	The Charles H. Boustead Tunnel (a.k.a. Divide Tunnel) transports water from the Fryingpan River under the Continental Divide to the head of Turquoise Reservoir in the Arkansas River Basin. Diversions from the west slope are made from an elevation of 10,002 feet. The Boustead Tunnel is approximately 5.4 miles long, is horseshoe shaped with a diameter of 10.5 feet, has a maximum overburden of approximately 2000 feet, and a decreed capacity of 1000 cubic feet per second. The basin consists primarily of high mountain terrain, some of which is above tree line, with very little development except for the low volume trail road. No hydrologic condition changes were apparent this water year.
Gage-Height Record.--	Primary record is 15-minute satellite data with the SDR used for backup purposes. Record is complete and reliable.
Datum Corrections.--	Levels were last run on Aug 11, 2005. Elevation control was established using RM #1 (Elev 9.75) as base. No corrections were necessary.
Rating.--	Control is a 15-foot concrete Parshall Flume. A standard 15-ft. Parshall flume table (BOUTUNCO01 dated May 16, 1972) was used this water year. Three discharge measurements (No. 68-70) were made during the year. Measurements ranged in discharge from 300 cfs to 976 cfs. They cover the range in stage experienced, except many low and medium flow days of Oct 1, 2010 – May 28, 31; July 24 – Sept 30 2011. The peak flow of 973 cfs occurred at 2030 July 5, 2011 at a gage height of 5.58 ft with a shift of +0.26 ft. It exceeded the stage of Meas. 69, made July 6, 2011, by 0.07 feet.
Discharge.--	Shifts were distributed by stage for the entire water year using shift curve BOUTUNCOVS09 which is based on a number of previous and current year measurements. Measurements show raw shifts ranging from +0.19 ft to +0.34 ft. Measurement 68 and 69 were discounted from -1.3% to 2.2% to smooth distribution and fit the historical shift curve. Msmnt 70 made using the ADCP showed a shift of +0.19 ft for a gage height of 2.61 ft, which is outside the range expected at this gage height. The shift required an 11.5% adjustment to 0.00 ft, and thus was not used.
Special Computations.--	Continued use of the ADCP was attempted this water year and it was found the boat could not handle flows much higher than a GH of 3 ft. The tunnel surges, therefore most measurements with the ADCP were performed using 8 transects to average the surge.
Remarks.--	Record is considered good. The peak event is rated good. The Boustead Tunnel flume is located approximately 90 feet downstream of the mouth of Boustead Tunnel. The approach channel from the mouth of the tunnel to the flume is a concrete rectangular section. The channel section diverges in width from the tunnel width at the mouth to a width of approximately 25 feet over a distance of about 70 feet. This is followed by approximately 20 feet of channel having a constant 25-ft width. This constant width section ends at the flume entrance. The floor of the approach channel is flat. There are no provisions over this 90-foot reach for a deeper channel section prior to the flume entrance, nor any other channel modifications, to help still and slow the flow to the recommended tranquil flow conditions. Observations of flow conditions at higher stages over the past several years have indicated the approach velocities to the flume are too high and poorly distributed by the time flow reaches the flume entrance. This results in increasing positive shifts to the rating as stage increases. Station operated and record developed by Cheston Hart.
Recommendations.--	More testing of the ADCP and additional ADCP measurements should be attempted. Due to the access and difficulty in setting up temporary cable the ADCP was limited to testing only in flume in WY11. Downstream conditions may allow higher flow measurements to be performed using the ADCP. Additional measurements are needed to better define the variable stage shift relationship and where the transition away from the standard 15 ft PF rating occurs.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09077160 CHARLES H. BOUSTEAD TUNNEL

RATING TABLE-- BOUTUNCO01 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

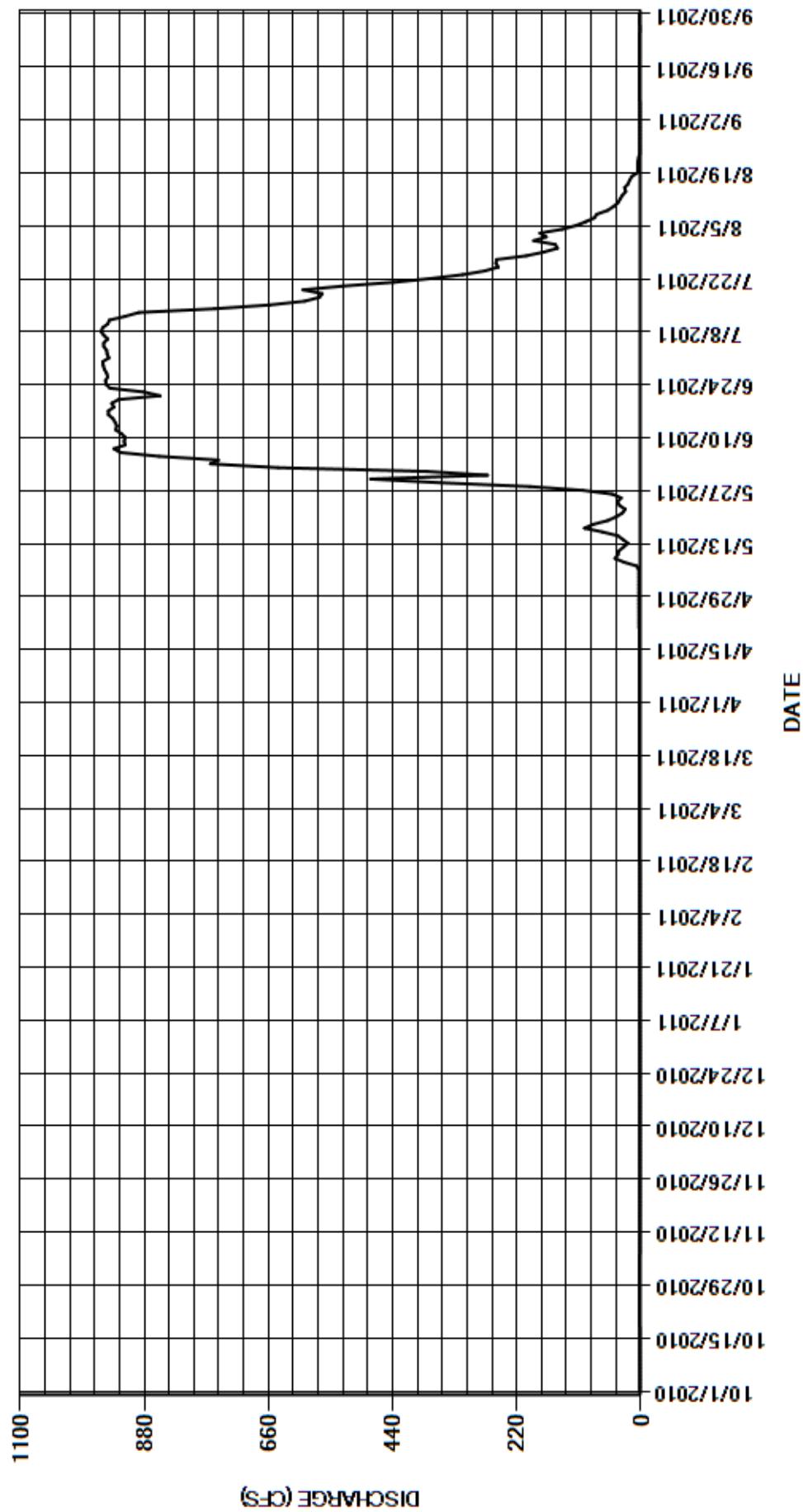
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.9	2.5	1.9	1.9	2.2	2.5	2.8	3.7	380	943	190	2.2
2	1.9	2.5	1.9	1.9	2.2	2.5	2.8	3.7	643	946	168	2.2
3	1.9	2.5	1.9	1.9	2.2	2.5	2.9	3.7	763	947	179	2.2
4	1.9	2.5	1.9	1.9	2.2	2.5	2.8	3.7	749	952	140	2.2
5	1.9	2.5	1.9	1.9	2.2	2.5	2.8	3.7	854	952	115	2.2
6	1.9	2.5	1.9	2.1	2.2	2.8	2.8	4.0	923	945	98	2.3
7	1.9	2.4	1.9	2.2	2.2	2.8	2.8	7.4	934	952	83	2.5
8	1.9	2.4	1.9	2.2	2.2	2.8	2.8	30	914	957	78	2.5
9	2.1	2.4	1.9	2.2	2.2	2.8	2.6	46	916	954	59	2.5
10	2.2	2.3	1.9	2.2	2.2	2.8	3.1	41	914	945	49	2.5
11	2.2	2.3	1.9	2.2	2.2	2.8	3.1	39	921	942	41	2.5
12	2.2	2.3	1.9	2.2	2.2	2.8	3.1	31	931	914	37	2.5
13	2.2	2.2	1.9	2.2	2.2	2.8	3.2	23	929	890	33	2.5
14	2.2	2.2	1.9	2.2	2.2	3.1	3.1	32	932	756	27	2.5
15	2.2	2.4	1.9	2.2	2.2	3.1	2.8	41	936	658	29	2.5
16	2.2	2.4	1.9	2.2	2.2	3.0	2.8	68	944	596	23	2.5
17	2.4	2.3	1.9	2.2	2.3	2.9	3.0	100	944	570	20	2.6
18	2.5	2.2	1.9	2.2	2.5	2.9	3.1	85	934	565	16	2.7
19	2.5	2.2	1.9	2.2	2.5	2.9	3.1	59	938	599	5.9	2.8
20	2.5	2.2	1.9	2.2	2.5	3.0	3.1	44	926	528	5.7	2.8
21	2.5	2.2	1.9	2.2	2.5	3.1	3.4	33	852	438	5.7	2.8
22	2.5	2.2	1.9	2.2	2.5	3.1	3.4	28	881	372	5.5	2.7
23	2.5	2.2	1.9	2.2	2.5	3.1	3.4	38	941	316	4.0	2.5
24	2.6	2.2	1.9	2.2	2.5	3.1	3.4	42	948	277	2.2	2.5
25	2.8	2.1	1.9	2.2	2.5	3.1	3.5	35	949	253	2.2	2.5
26	2.6	1.9	1.9	2.2	2.5	3.1	3.7	51	945	257	2.2	2.4
27	2.5	1.9	1.9	2.2	2.5	3.1	3.7	103	947	256	2.2	2.5
28	2.5	1.9	1.9	2.2	2.5	3.1	3.7	197	951	203	2.2	2.5
29	2.5	1.9	1.9	2.2	---	3.0	3.7	354	953	172	2.2	2.5
30	2.5	1.9	1.9	2.2	---	2.8	3.7	479	954	148	2.2	2.5
31	2.5	---	1.9	2.2	---	2.8	---	272	---	152	2.2	---
TOTAL	70.6	67.6	58.9	66.6	65.0	89.2	94.2	2300.9	26646	19355	1429.4	74.6
MEAN	2.28	2.25	1.90	2.15	2.32	2.88	3.14	74.2	888	624	46.1	2.49
AC-FT	140	134	117	132	129	177	187	4560	52850	38390	2840	148
MAX	2.8	2.5	1.9	2.2	2.5	3.1	3.7	479	954	957	190	2.8
MIN	1.9	1.9	1.9	1.9	2.2	2.5	2.6	3.7	380	148	2.2	2.2
CAL YR	2010	TOTAL	28565.7	MEAN	78.3	MAX	958	MIN	1.9	AC-FT	56660	
WTR YR	2011	TOTAL	50318.0	MEAN	138	MAX	957	MIN	1.9	AC-FT	99810	

MAX DISCH: 973 CFS AT 20:30 ON JUL 05,2011 GH 5.58 FT SHIFT 0.26 FT

MAX GH: 5.58 FT AT 20:30 ON JUL 05,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09077160 CHARLES H. BOUSTEAD TUNNEL
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
09073000 TWIN LAKES TUNNEL
Water Year 2011

Location.--	Lat. 39°04'56", Long. 106°32'24"; diverts water from tributaries of Roaring Fork River in Colorado River Basin to North Fork Lake Creek in sec. 22, T.11 S., R.82 W., in Arkansas River Basin.
Drainage Area and Period of Record.--	N/A
Equipment.--	Graphic water-stage recorder, satellite-monitored data collection platform (DCP) and shaft encoder in a 5 ft x 5 ft concrete shelter and well. Shaft encoder and chart are set to inside electric tape gage. An outside staff gage is used for supplemental reference. Control is a 12-foot concrete Parshall flume. No changes this water year.
Hydrologic Conditions.--	The collection system is located in the headwaters of the Roaring Fork River. Water is diverted into Grizzly reservoir, which is located in Lincoln Gulch. Grizzly has an active capacity of 570 acre-feet, but normally fluctuates less than 400 acre-feet. From Grizzly Reservoir, the water flows under the continental divide through the Twin lakes (a.k.a. Independence pass) Tunnel into North Fork Lake Creek. The Twin lakes Tunnel is circular, concrete lined and 8.5 feet in diameter. The tunnel is about 4 miles long and has a capacity of 625 cubic feet per second. The western portal of the Twin Lakes tunnel is at an elevation of 10,520 feet, the eastern portal is at 10,460 feet, and the tunnel has a maximum overburden of 2630 feet. During the winter the snow closes the road between the caretaker's house and the town of Aspen, the tunnel is then operated to allow the caretaker's family to travel thru the tunnel to Buena Vista each day. No hydrologic condition changes were apparent this water year.
Gage-Height Record.--	The primary record is 15-minute satellite data with chart record and DCP log as backup. Record is complete and reliable except for November 28, 2010 when the float tape was frozen in place and December 3, 2010 when the float was being maintained. Both data gaps were replaced using good adjacent values without loss of accuracy. Winter operation (November-March) has historically been considered unreliable due to the practice of using a drain pipe to circulate water through the stilling well as a de-icing mechanism. Use of drain valve this year did not seem to affect gage height in the stilling well and the circulating water did help in decreasing ice effect.
Datum Corrections.--	Levels were last run on 22 Oct 2007. No corrections were made.
Rating.--	Control is a 12-foot concrete Parshall flume. A standard 12-foot Parshall flume rating table (STD12FPF dated May 16, 1972) was used the entire water year. Five discharge measurements (Nos. 104-108) were made during the year. Measurements ranged in discharge from 105 to 627 cfs. They cover the range in stage experienced except for many lower flow days of October-December, 2010; January-April, May, August and September, 2011. The peak discharge of 628 cfs occurred at 2345 on June 28, 2011 at a gage height of 5.05 feet with a shift of 0.02 feet. Another peak with the same magnitude occurred at 10:45 on July 7, 2011. Both peaks exceeded the mean stage of Measurement 107, made July 7, 2011 by 0.04 feet.
Discharge.--	Wading measurements may be made in the flume at the staff gage (using extreme caution) up to a gage height of about 1.80 ft. High flow measurements are made with a bridge crane with the meter and weight assembly suspended at the outside staff gage position in the flume. A rigid 2-in pipe is installed at this location to act as a stay bar to reduce meter and weight movement downstream. Hose clamps on the pipe are used to control the position of the cable and reduce meter and weight lateral movement caused by the extreme turbulence in the measurement section. This measurement section is a standard 14.7 ft width. Shifting control method was used for the entire water year. Shifts occur due to excessive approach velocities and the turbulence/waves in the flume due to the approach section entering the flume at an angle. These problems are exacerbated in the gage height range of 2.5 to 4.5 ft. Shifts were distributed by stage using the variable stage-shift relationship TWITUNCOSC11Z for the entire water year. This variable stage shift relationship is based on historical measurements made at the gage. All WY11 measurements were discounted from 1 to 4% to fit the shift curve.
Special Computations.--	Variable stage shift curve TWITUNCOSC11Z is considered a valid temporary alternative for adjusting the standard rating table and calculating flows. Because it is difficult to read the outside staff gage at high flows due to surging and turbulence, the stilling well gage height value is used in the variable shift curve analysis as the basis for weighted mean gage height and water depth in the flume. During times of high flows, it appears that a drawdown effect may be lowering the gage height in the stilling well due to high velocities passing the inlet pipe. Since this is an unconfirmed phenomenon, stilling well gage height values are not adjusted.
Remarks.--	Record is considered good, except for the winter months of November through March, which is fair. The peak discharge is rated good. An ADVM was installed in the Tunnel upstream of the mouth as an additional measurement device, but up to this point has not produced reliable data. During this water year the ADVM was removed for repairs by the manufacturer. Station maintained and record developed by Cheston Hart.
Recommendations.--	Additional measurements are needed to better define shifts to the rating at medium and higher stages. Measurements and stage recording at the flume would benefit considerably from flow straightening and energy dissipation baffles installed upstream of the flume entrance.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09073000 TWIN LAKES TUNNEL

RATING TABLE-- STD12FTP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

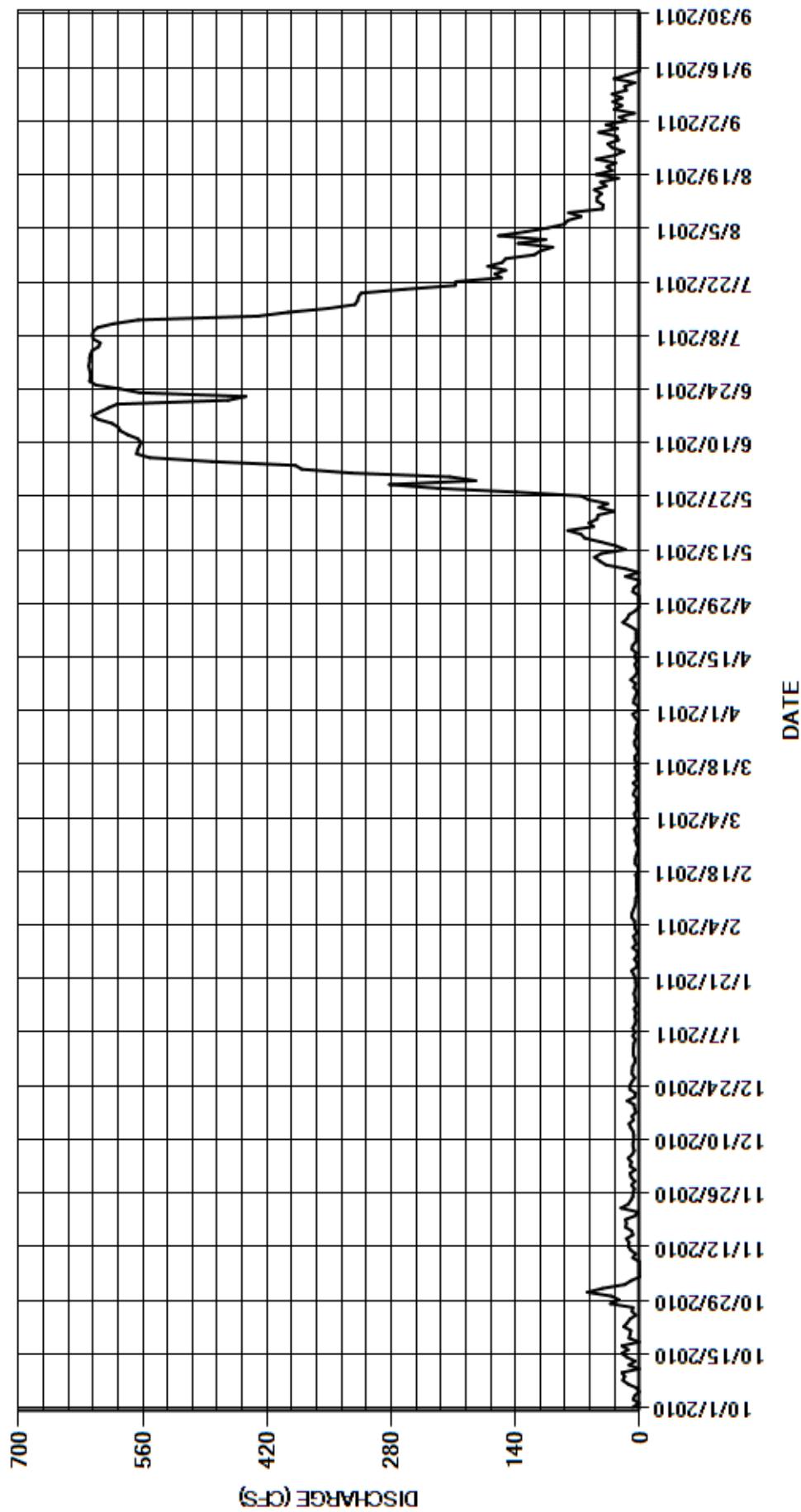
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.7	42	11	7.2	6.8	6.0	1.6	0.99	214	620	137	38
2	0.95	17	5.3	7.4	3.0	2.8	1.6	7.9	325	620	106	15
3	7.3	9.8	11	7.0	5.2	2.5	6.8	6.4	381	619	159	23
4	5.6	0.14	9.3	6.6	5.6	4.9	6.1	0.99	388	617	129	6.1
5	0.66	0.33	13	4.9	6.0	6.1	4.3	1.0	482	610	104	29
6	3.7	0.39	8.3	7.8	9.1	3.0	2.8	16	552	608	85	20
7	13	0.45	6.3	5.2	8.7	3.0	6.6	1.1	567	616	81	30
8	19	0.54	7.5	7.7	7.0	4.5	4.6	16	566	617	66	20
9	17	7.9	7.6	5.5	5.2	2.9	10	38	564	616	80	31
10	20	4.5	6.5	4.2	4.4	7.2	5.4	45	562	611	42	15
11	0.71	10	6.7	5.6	4.4	5.7	2.6	51	566	593	41	17
12	12	13	7.5	4.3	2.4	3.1	3.8	43	577	565	48	5.6
13	5.1	12	10	6.3	3.6	7.3	5.5	16	585	430	48	29
14	14	15	12	3.2	3.3	2.3	2.9	27	588	396	43	14
15	20	7.7	6.9	5.1	3.8	4.7	5.8	44	595	351	51	0.52
16	13	8.9	8.7	5.1	3.3	2.7	3.9	62	610	321	38	0.52
17	20	16	4.3	6.6	4.5	5.7	8.8	66	617	318	44	0.52
18	0.71	15	5.8	5.1	2.1	2.0	7.9	81	608	317	24	0.52
19	12	16	6.4	4.1	2.0	5.5	4.1	52	599	314	49	0.52
20	11	4.7	14	4.5	5.2	5.3	4.1	57	589	265	31	0.52
21	10	2.7	5.6	5.0	5.0	1.9	4.2	48	464	208	37	0.52
22	18	21	4.8	6.8	4.2	3.2	4.2	47	444	207	27	0.52
23	14	13	11	9.2	2.7	5.6	11	29	564	156	49	0.52
24	11	10	11	3.2	1.6	5.8	19	46	586	163	28	0.52
25	4.4	7.7	8.7	2.8	3.6	2.8	14	36	613	151	18	0.52
26	8.6	7.5	5.7	5.9	4.7	5.1	12	57	620	171	31	0.52
27	7.7	6.0	8.3	2.7	3.3	4.2	4.9	66	619	155	36	0.52
28	33	e9.0	8.3	2.9	4.5	3.8	0.75	139	619	151	24	0.52
29	23	5.5	8.0	7.9	---	1.5	0.82	227	620	119	26	0.52
30	32	9.5	5.7	4.0	---	5.0	0.88	282	621	112	46	0.52
31	59	---	5.3	5.5	---	8.0	---	185	---	98	25	---
TOTAL	424.13	293.25	250.5	169.3	125.2	134.1	170.95	1794.38	16305	11715	1753	301.02
MEAN	13.7	9.78	8.08	5.46	4.47	4.33	5.70	57.9	544	378	56.5	10.0
AC-FT	841	582	497	336	248	266	339	3560	32340	23240	3480	597
MAX	59	42	14	9.2	9.1	8.0	19	282	621	620	159	38
MIN	0.66	0.14	4.3	2.7	1.6	1.5	0.75	0.99	214	98	18	0.52
CAL YR	2010	TOTAL	23562.67	MEAN	64.6	MAX	609	MIN	0.14	AC-FT	46740	
WTR YR	2011	TOTAL	33435.83	MEAN	91.6	MAX	621	MIN	0.14	AC-FT	66320	

MAX DISCH: 628 CFS AT 23:45 ON JUN 28,2011 GH 5.05 FT SHIFT 0.02 FT

MAX GH: 5.05 FT AT 23:45 ON JUN 28,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09073000 TWIN LAKES TUNNEL
WY2011 HYDROGRAPH



ARKANSAS RIVER BASIN
LARKSPUR DITCH AT MARSHALL PASS
Water Year 2011

Location.--	Lat. 38°23'00", Long. 106°15'00", diverts water from tributaries of Tomichi Creek between headgates (in sec. 11, T.48 N., R.6 E., and sec. 1, T.47 N., R.6 E.), and Marshall Pass, in Gunnison River Basin, to Poncha Creek (tributary to South Arkansas River) in SE¼ sec. 24, T.48 N., R.6 E., in Arkansas River Basin.
Drainage Area and Period of Record.--	N/A
Equipment.--	High data rate Sutron SatLink Logger DCP and shaft encoder with an SDR recorder in a 36-in x 36-in metal shelter and well. Shaft encoder and SDR are set to outside staff gage. Control is a 2-foot steel Parshall flume.
Hydrologic Conditions.--	The ditch was built in 1939, and diverts water from Hurry Creek, from north of the west side of Marshall Pass, approximately 3 miles west of Poncha Pass. The ditch crosses Marshall Pass at an elevation of 10,900 feet, and delivers water to Poncha Creek, a tributary of the South Arkansas River. The ditch runs approximately 1.5 miles. The basin consists primarily of high mountain terrain, most of which is above tree line with little to no development. No hydrologic condition changes were apparent this water year.
Gage-Height Record.--	The primary record is 15-minute satellite data with SDR data used for backup purposes. The record is complete and reliable. The gage was shut down and no water diverted for the period: 1545 Oct 20 2010 to 0715 June 1 2011.
Datum Corrections.--	Levels were last run July 25, 2006. No corrections were made at that time.
Rating.--	A standard, 2 ft. Parshall flume table (STD02FTPF) was used for the entire water year. Four discharge measurements, Nos. 53-56, ranging in discharge from 0.39 to 3.35 cfs, were made during the water year. Mean daily flows exceeded high flow measurement No. 53 on June 2-16 2011; and were below measurement No. 56 on Oct 1-6, 14, 16-19 2010; Sep 3 2011. The peak discharge of 6.91 cfs occurred at 1745 June 2, 2011 at a gage height of 0.91 ft with a shift of 0.00 ft. It exceeded the stage of measurement No. 53 by 0.35 ft.
Discharge.--	Measurements are made from a walkway across the flume at a position where the meter axis is parallel with the staff gage and well intake. Measurements 53 and 55 were adjusted between 2.8% and -4.5%. Discharge was computed by applying the rating directly to the gage height record with a shift of 0.00 ft
Special Computations.--	No ice effected days were found this water year. Ice days are predicted from ice spikes and by evaluating the time of the spike. All spikes were found to be released water once the ditch had thawed.
Remarks.--	Given the high elevation conditions and lack of site visits the record is considered fair. The peak event is also rated fair. Station maintained and record developed by Cheston Hart.
Recommendations.--	Additional attempts should be made to get a high flow measurements and continued evaluation if a variable curve should be used. A full flume inspection should be scheduled and completed.

STATE OF COLORADO
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LARKSPUR DITCH AT MARSHALL PASS

RATING TABLE-- STD02FTP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

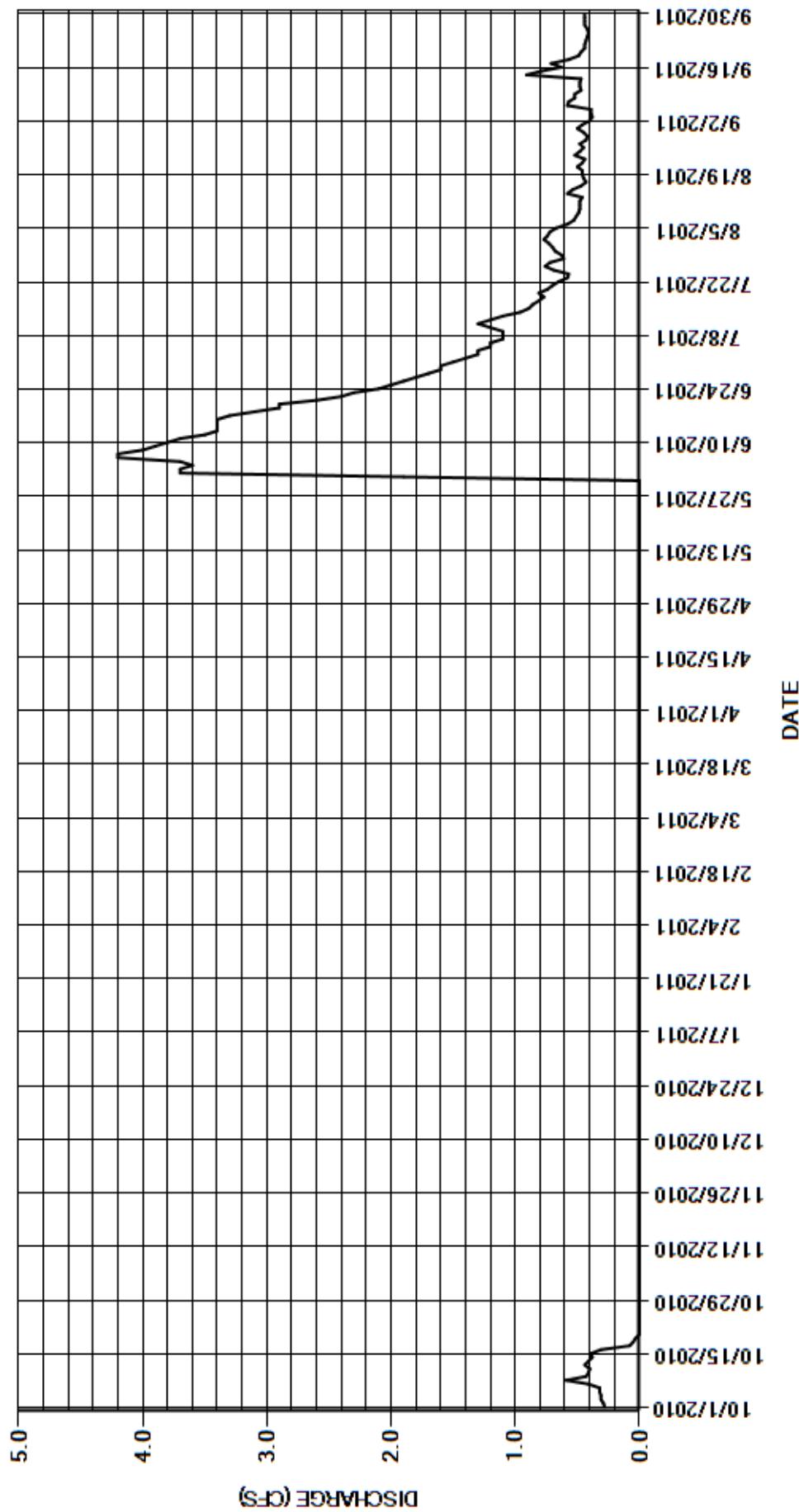
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.9	1.5	0.73	0.46
2	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.7	1.4	0.77	0.40
3	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.7	1.3	0.74	0.38
4	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.6	1.3	0.72	0.39
5	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.7	1.2	0.67	0.39
6	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.2	1.2	0.58	0.58
7	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.2	1.1	0.53	0.57
8	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.0	1.1	0.51	0.52
9	0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.9	1.1	0.49	0.52
10	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	1.2	0.48	0.47
11	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.7	1.3	0.48	0.48
12	0.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.5	1.2	0.48	0.48
13	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.4	1.1	0.46	0.47
14	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.4	0.96	0.58	0.91
15	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.4	0.89	0.54	0.79
16	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.4	0.86	0.47	0.63
17	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.3	0.81	0.43	0.71
18	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.1	0.77	0.45	0.57
19	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.9	0.81	0.46	0.49
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.9	0.74	0.46	0.47
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.6	0.70	0.50	0.44
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.4	0.65	0.46	0.44
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.3	0.58	0.44	0.43
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	0.57	0.52	0.42
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.0	0.69	0.48	0.41
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.9	0.76	0.45	0.42
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.8	0.72	0.48	0.44
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.7	0.61	0.43	0.44
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	1.6	0.63	0.42	0.44
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	1.6	0.68	0.45	0.44
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	0.70	0.50	---
TOTAL	6.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	89.7	29.13	16.16	15.00
MEAN	0.20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.99	0.94	0.52	0.50
AC-FT	12	0	0	0	0	0	0	0	178	58	32	30
MAX	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.2	1.5	0.77	0.91
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.6	0.57	0.42	0.38
CAL YR	2010	TOTAL	117.02	MEAN	0.32	MAX	3.6	MIN	0.00	AC-FT	232	
WTR YR	2011	TOTAL	156.15	MEAN	0.43	MAX	4.2	MIN	0.00	AC-FT	310	

MAX DISCH: 6.91 CFS AT 17:45 ON JUN 02,2011 GH 0.91 FT SHIFT 0 FT

MAX GH: 0.91 FT AT 17:45 ON JUN 02,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LARKSPUR DITCH AT MARSHALL PASS
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08213500 RIO GRANDE RIVER AT THIRTY MILE BRIDGE NEAR CREEDE
Water Year 2011

Location.--	Lat 37°43'29", long 107°15'20" referenced to North American Datum of 1983 (Weminuche Pass, CO quad, scale 1:24,000), UTM Zone 13 301212 E and 4177665 N, in SW ¼ NE ¼ sec. 13, T.40 N., R.4 W., New Mexico Principal Meridian, Hinsdale County, CO, Hydrologic Unit 13010001, on right bank 70 ft downstream from bridge, 500 ft upstream from Squaw Creek, 0.7 mi downstream from Rio Grande Reservoir, and 20 mi southwest of Creede, CO.
Drainage Area and Period of Record.--	163 mi ² . Jun. 1909 to Sep. 1923, May 1925 to current year. No winter records 1910, 1926. Monthly data only for some periods.
Equipment.--	Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), and a float-operated shaft encoder in a 4 ft by 4 ft timber shelter and corrugated metal well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. The cableway is located 21 feet upstream of gage. On Aug. 17, 2011 the DCP was upgraded to a Satlink2 and the shaft encoder was replaced with a Stage-Discharge-Recorder.
Hydrologic Conditions.--	Flows regulated by Rio Grande Reservoir.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup. After Aug. 17, 2011 the SDR log is also a backup. Record is complete and reliable, except for Nov. 5-7, 2010 when the station was isolated, and Nov. 8, 2010 to Mar. 28, 2011 when the station was closed for the winter. There were two corrections made to the shaft encoder. A -0.01 ft. correction on Jun. 3 and a -0.01 ft. correction on Sep. 7, which were prorated by time from previous visits.
Datum Corrections.--	Levels were run to the Reference Point (RP) inside the gage Sep. 7, 2011 using R. M. No. 2 as base. The RP elevation was outside allowable limits, so a -0.02 ft GH correction was made. The correction was carried straight back to the station opening on Mar 28, 2011. Two-peg tests were performed on the Lietz level (SN 130869) on Jul. 28, 2011 and Sep. 26, 2011. A minor adjustment to the level instrument was made Sep. 26, 2011.
Rating.--	Control is a boulder and cobble channel. A bridge and bridge piers were removed in the spring of 2008. This has caused the channel to slowly scour. Rating No. 12, in use since Oct. 1, 1994, was used again this year. The rating is well defined from 8 to 2500 cfs. Twelve measurements (Nos. 846-857) were made this year ranging in discharge from 2.56 to 1200 cfs. They cover the range of daily flows experienced, except for the higher daily flows on June 6-9, 11, 14-17, 24-27, 2011. The peak flow of 1260 cfs occurred at 10:00 on Jun. 20, 2011 at a gage height of 3.63 feet with a shift of +0.08 ft. It exceeded high measurement No. 852 on Jun. 3, 2011 at a GH of 3.56 ft by 0.07 feet in stage.
Discharge.--	Variable shift curve RIOMILCOVS1102 was used all year. Measurement shifts ranged from -0.02 to +0.10 feet. All were given full weight except for Nos. 846, 850, 851, 852, 853, 854, and 856, which were adjusted by as much as 4% to smooth shift distribution.
Special Computations.--	Discharge for periods when station isolated and closed for the winter was estimated using simple proration between measurements at closing and opening station. There was no change in reservoir release gates during the period, so change in flow is attributed to increased reservoir elevation.
Remarks.--	Record is good except for periods of no gage-height record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	Wait for channel to stabilize and develop a new rating curve.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08213500 RIO GRANDE RIVER AT THIRTY MILE BRIDGE NEAR CREEDE

RATING TABLE-- RIOMILCO12 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

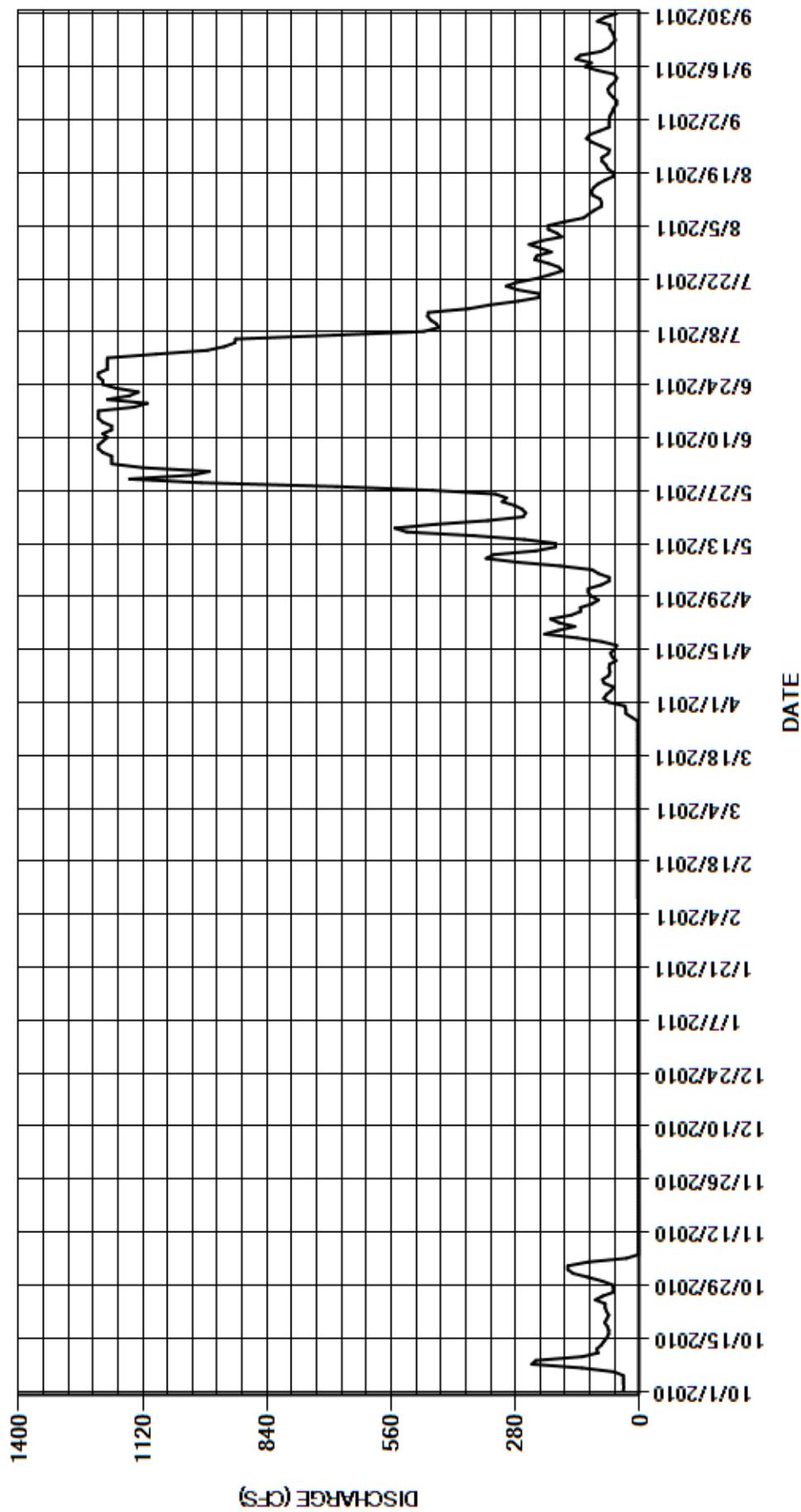
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	37	150	e3.1	e3.6	e4.0	e4.3	70	116	970	1200	220	69
2	36	162	e3.1	e3.6	e4.0	e4.3	81	87	1120	1090	176	69
3	37	162	e3.1	e3.7	e4.0	e4.3	75	69	1190	975	187	67
4	37	117	e3.2	e3.7	e4.0	e4.3	65	69	1190	936	206	62
5	37	e30	e3.2	e3.7	e4.0	e4.3	58	93	1190	913	206	59
6	58	e2.6	e3.2	e3.7	e4.0	e4.3	80	107	1210	911	169	52
7	130	e2.6	e3.2	e3.7	e4.0	e4.3	84	179	1220	689	127	52
8	243	e2.6	e3.2	e3.7	e4.1	e4.3	70	275	1220	487	115	61
9	234	e2.6	e3.2	e3.7	e4.1	e4.3	67	346	1210	453	103	69
10	129	e2.7	e3.3	e3.7	e4.1	e4.3	69	329	1200	458	87	72
11	94	e2.7	e3.3	e3.8	e4.1	e4.3	68	234	1210	471	86	66
12	97	e2.7	e3.3	e3.8	e4.1	e4.4	53	190	1190	478	89	56
13	87	e2.7	e3.3	e3.8	e4.1	e4.4	62	190	1190	477	106	52
14	81	e2.8	e3.3	e3.8	e4.1	e4.4	66	260	1210	386	109	57
15	74	e2.8	e3.3	e3.8	e4.1	e4.4	56	374	1220	338	104	95
16	70	e2.8	e3.4	e3.8	e4.1	e4.4	52	525	1220	274	94	123
17	70	e2.8	e3.4	e3.8	e4.1	e4.4	85	552	1220	226	78	109
18	73	e2.8	e3.4	e3.8	e4.1	e4.4	141	461	1140	227	59	144
19	79	e2.9	e3.4	e3.8	e4.2	e4.4	214	343	1110	275	60	134
20	74	e2.9	e3.4	e3.9	e4.2	e4.4	183	263	1200	301	72	88
21	70	e2.9	e3.4	e3.9	e4.2	e4.5	146	257	1150	276	76	70
22	75	e2.9	e3.5	e3.9	e4.2	e4.5	182	265	1130	232	85	63
23	78	e3.0	e3.5	e3.9	e4.2	e4.5	201	282	1180	202	85	55
24	78	e3.0	e3.5	e3.9	e4.2	e4.5	155	310	1210	175	71	58
25	100	e3.0	e3.5	e3.9	e4.2	e4.5	133	300	1210	182	68	61
26	84	e3.0	e3.5	e3.9	e4.2	e4.5	134	325	1220	206	87	67
27	60	e3.0	e3.5	e3.9	e4.2	e4.5	108	466	1220	237	107	67
28	59	e3.1	e3.6	e3.9	e4.2	e18	93	683	1200	232	120	95
29	62	e3.1	e3.6	e4.0	---	31	109	988	1200	199	113	79
30	85	e3.1	e3.6	e4.0	---	31	116	1150	1200	224	91	52
31	117	---	e3.6	e4.0	---	34	---	1010	---	249	69	---
TOTAL	2645	692.1	104.1	118.1	115.1	232.4	3076	11098	35550	13979	3425	2223
MEAN	85.3	23.1	3.36	3.81	4.11	7.50	103	358	1185	451	110	74.1
AC-FT	5250	1370	206	234	228	461	6100	22010	70510	27730	6790	4410
MAX	243	162	3.6	4.0	4.2	34	214	1150	1220	1200	220	144
MIN	36	2.6	3.1	3.6	4.0	4.3	52	69	970	175	59	52
CAL YR	2010	TOTAL	54959.5	MEAN	151	MAX	1180	MIN	2.6	AC-FT	109000	
WTR YR	2011	TOTAL	73257.8	MEAN	201	MAX	1220	MIN	2.6	AC-FT	145300	

MAX DISCH: 1260 CFS AT 10:00 ON JUN 20,2011 GH 3.63 FT SHIFT 0.08 FT

MAX GH: 3.63 FT AT 10:00 ON JUN 20,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08213500 RIO GRANDE RIVER AT THIRTY MILE BRIDGE NEAR CREEDE
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08214500 NORTH CLEAR CREEK BELOW CONTINENTAL RESERVOIR
Water Year 2011

Location.--	Lat 37°53'18", long 107°12'13" referenced to North American Datum of 1983 (Slumgullion Pass, CO quad, scale 1:24,000), UTM Zone 13 306230 E and 4195705 N, in NE ¼ SW ¼ sec. 21, T.42 N., R.3 W., New Mexico Principal Meridian, Hinsdale County, CO, Hydrologic Unit 13010001, on left bank 100 ft downstream from bridge, 1,000 ft downstream from Continental Reservoir, and 15 mi west of Creede, CO.
Drainage Area and Period of Record.--	51.7 mi ² . from topographic map, San Cristobal Quad. 1929 to current year.
Equipment.--	Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), and a float-operated shaft encoder in a 4 ft by 4 ft timber shelter and concrete well. Primary reference gage is a drop tape from reference point on shelf. Established secondary outside reference mark on bridge with tape and weight on May 27, 2011. DCP and shaft encoder upgraded to Satlink2 and SDR on Aug. 17, 2011.
Hydrologic Conditions.--	Gage is below Continental Reservoir and all flows are regulated.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Nov. 8, 2010 through Apr. 20, 2011 when the station was closed for the winter and May 2-5, 2011 when the well was frozen. There were two shaft encoder corrections: +0.01 and -0.01, which were prorated by time from previous visits.
Datum Corrections.--	Levels were run on May 27, 2011 using R.M. No. 4 as base. The RP was within allowable limits so no correction was made. Outside reference mark was established on footbridge. Two-peg test was performed on May 27, 2011 and no adjustment was needed.
Rating.--	The control is a concrete ramp flume. There is a two foot wide notch in the middle of the ramp to provide more sensitivity at very low flows. Rating 23 was used from Oct 1-5, 2010. Rating No. 24-1 was created and used this year starting October 5, 2010. The new rating was created because of known issues with the velocity profile at the measuring section, which were identified by using ADCP and current meters. Discharge measurements consistently show a difference between the two methods. Rating 24-1 was drawn to best fit both types of measurements without giving more weight to either method. With our current knowledge, neither method can be considered superior at this site. Rating No. 24-1 is considered fairly well defined from 0 to 300 cfs. Twelve measurements (Nos. 800-811) were made this year ranging in discharge from 0.16 to 321 cfs. The measurements cover the range experienced except for the higher daily flows on June 16-18, 2011. The peak flow of 368 cfs occurred at 1700 on June 17, 2011 at a gage height of 3.35 feet with a shift of 0.00 feet. It exceeded high measurement No. 807 (GH = 3.28), made June 15, 2011 by 0.07 feet in stage.
Discharge.--	Shifting control method was used for all good record periods. Shifts were applied as defined by measurements and distributed by time. Measurement shifts ranged from -0.04 to +0.04 ft. All measurements were adjusted except for 800 and 801. Because ADCP measurements and current meter measurements tend to differ in measured flow for the same gage height, rating no. 24-1 was drawn as the best fit of the measurements using both methods since neither method has proven to be more accurate. The average of the two methods is considered superior to any individual measurement or method. Measurement 807, the high flow measurement, was adjusted -5% back to the rating because the average measurement trend is considered superior to any individual measurement. There was a -0.02 ft. cleaning correction noted on Nov.8, 2010, and was accounted for in the shift and applied between Nov.1 and Nov 8, 2010.
Special Computations.--	Discharge for period of winter no gage-height record was estimated using two measurements and simple proration based on reservoir contents. There was no change of reservoir gates during the period.
Remarks.--	Record is fair except for periods of no gage-height record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	Analyze the measurement section velocity profile and improve the current section or identify a new location to make measurements.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08214500 NORTH CLEAR CREEK BELOW CONTINENTAL RESERVOIR

RATING TABLE-- NCLCONCO23 USED FROM 01-OCT-2010 TO 05-OCT-2010
NCLCONCO24-1 USED FROM 05-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14	3.7	e0.17	e0.18	e0.20	e0.21	e0.22	24	134	120	26	14
2	10	0.21	e0.17	e0.19	e0.20	e0.21	e0.22	e24	122	123	23	14
3	7.3	0.19	e0.17	e0.19	e0.20	e0.21	e0.22	e24	122	71	21	14
4	6.0	0.19	e0.17	e0.19	e0.20	e0.21	e0.22	e24	114	52	21	15
5	5.9	0.19	e0.17	e0.19	e0.20	e0.21	e0.22	e19	108	64	24	15
6	5.8	0.19	e0.17	e0.19	e0.20	e0.21	e0.23	19	119	68	26	15
7	9.7	0.19	e0.17	e0.19	e0.20	e0.21	e0.23	26	132	71	23	15
8	17	e0.17	e0.17	e0.19	e0.20	e0.21	e0.23	47	132	70	19	16
9	21	e0.16	e0.17	e0.19	e0.20	e0.21	e0.23	60	117	70	15	16
10	20	e0.16	e0.17	e0.19	e0.20	e0.21	e0.23	55	109	49	12	16
11	20	e0.16	e0.17	e0.19	e0.20	e0.21	e0.23	49	98	45	12	15
12	16	e0.16	e0.18	e0.19	e0.20	e0.21	e0.23	44	92	67	12	13
13	13	e0.16	e0.18	e0.19	e0.20	e0.21	e0.23	37	88	72	12	13
14	13	e0.16	e0.18	e0.19	e0.20	e0.21	e0.23	35	82	54	12	13
15	14	e0.16	e0.18	e0.19	e0.20	e0.21	e0.23	58	176	45	12	16
16	14	e0.16	e0.18	e0.19	e0.20	e0.22	e0.23	79	334	42	12	19
17	12	e0.16	e0.18	e0.19	e0.20	e0.22	e0.23	87	345	33	12	19
18	11	e0.16	e0.18	e0.19	e0.20	e0.22	e0.24	89	348	94	12	19
19	11	e0.17	e0.18	e0.19	e0.21	e0.22	e0.24	89	189	135	15	15
20	11	e0.17	e0.18	e0.19	e0.21	e0.22	e34	57	76	140	17	13
21	11	e0.17	e0.18	e0.19	e0.21	e0.22	57	43	76	146	17	13
22	11	e0.17	e0.18	e0.19	e0.21	e0.22	47	55	51	75	17	12
23	13	e0.17	e0.18	e0.19	e0.21	e0.22	41	61	38	32	16	12
24	15	e0.17	e0.18	e0.19	e0.21	e0.22	39	61	42	29	16	12
25	15	e0.17	e0.18	e0.20	e0.21	e0.22	37	51	53	26	16	12
26	15	e0.17	e0.18	e0.20	e0.21	e0.22	37	44	61	26	16	12
27	15	e0.17	e0.18	e0.20	e0.21	e0.22	54	67	89	26	16	12
28	12	e0.17	e0.18	e0.20	e0.21	e0.22	74	101	112	26	15	11
29	8.3	e0.17	e0.18	e0.20	---	e0.22	50	133	120	26	14	10
30	8.0	e0.17	e0.18	e0.20	---	e0.22	31	150	118	26	14	10
31	7.8	---	e0.18	e0.20	---	e0.22	---	151	---	26	14	---
TOTAL	382.8	8.67	5.47	5.95	5.70	6.67	505.34	1863	3797	1949	509	421
MEAN	12.3	0.29	0.18	0.19	0.20	0.22	16.8	60.1	127	62.9	16.4	14.0
AC-FT	759	17	11	12	11	13	1000	3700	7530	3870	1010	835
MAX	21	3.7	0.18	0.20	0.21	0.22	74	151	348	146	26	19
MIN	5.8	0.16	0.17	0.18	0.20	0.21	0.22	19	38	26	12	10

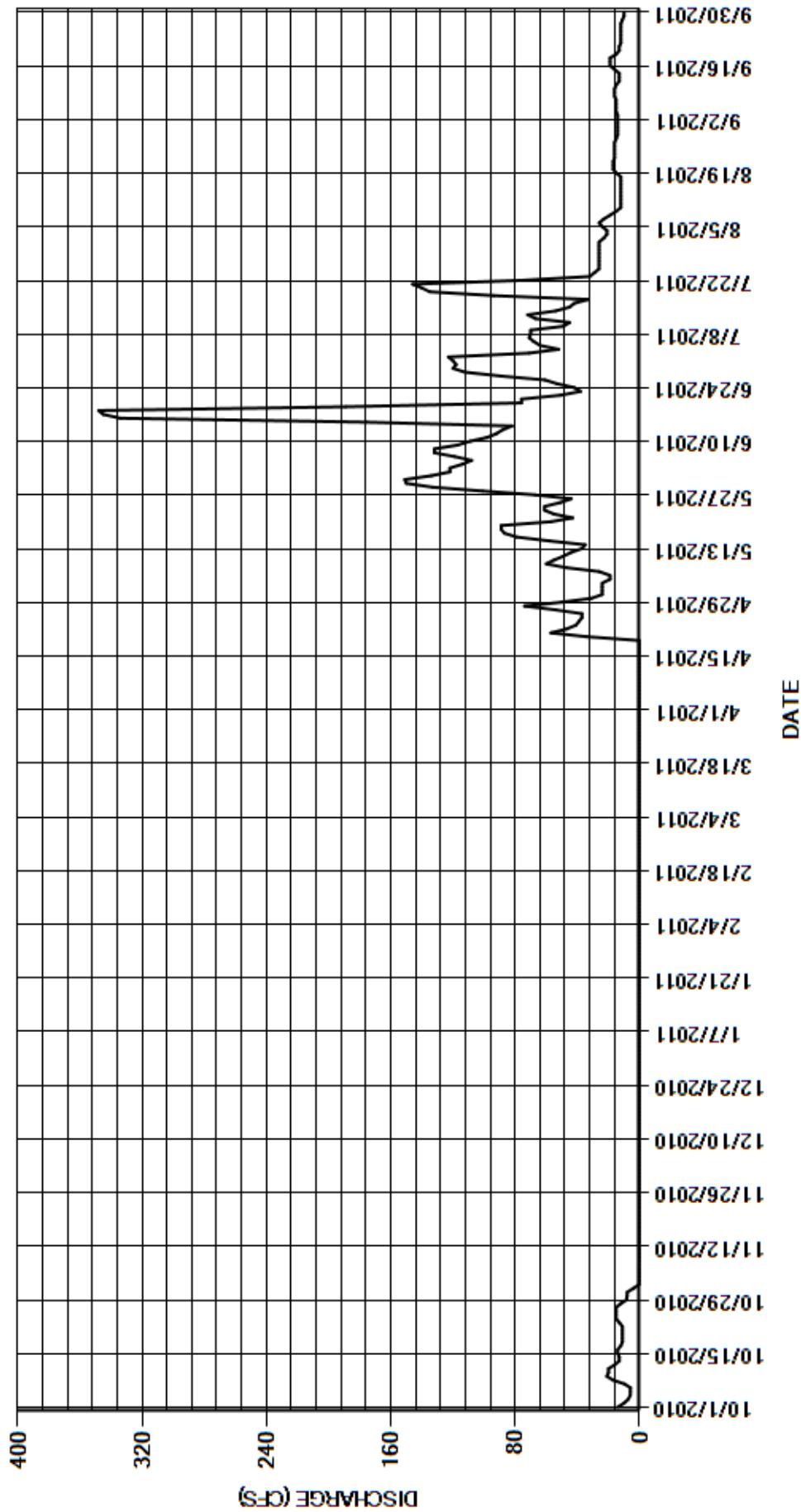
CAL YR	2010	TOTAL	8749.94	MEAN	24.0	MAX	269	MIN	0.14	AC-FT	17360
WTR YR	2011	TOTAL	9459.60	MEAN	25.9	MAX	348	MIN	0.16	AC-FT	18760

MAX DISCH: 368 CFS AT 17:00 ON JUN 17,2011 GH 3.35 FT SHIFT 0 FT

MAX GH: 3.35 FT AT 17:00 ON JUN 17,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08214500 NORTH CLEAR CREEK BELOW CONTINENTAL RESERVOIR
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08217500 RIO GRANDE RIVER AT WAGON WHEEL GAP
Water Year 2011

Location.--	Lat 37°46'1", long 106°49'53" referenced to North American Datum of 1983 (Wagon Wheel Gap, CO quad, scale 1:24,000), UTM Zone 13 338693 E and 4181532 N, in NW ¼ NE ¼ sec. 35, T.41 N., R.1 E., New Mexico Principal Meridian, Mineral County, CO, Hydrologic Unit 13010001, on left bank 40 ft downstream from private bridge, 0.3 mi upstream from Goose Creek, and 0.3 mi west of Wagonwheel Gap, CO.
Drainage Area and Period of Record.--	780 mi ² . 1951 to current year.
Equipment.--	Graphic water-stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), and a float-operated shaft encoder in a 4 ft by 4 ft timber shelter with a 4 ft diameter concrete well. Graphic water-stage recorder was removed August 18, 2011 and DCP was upgraded to Satlink2 with SDR shaft encoder. The primary reference gage is a drop tape from reference point on shelf. Outside staff gage is located on bridge pier. The cableway is located 350 feet above gaging station.
Hydrologic Conditions.--	Flow is somewhat regulated by Rio Grande Reservoir and other small reservoirs. There are several small diversions above gage for livestock and domestic use. The basin is mostly undeveloped with the exception of a few minor subdivisions and the town of Creede.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup until August 18 when graphic stage-recorder was removed. After August 18, 2011 primary record is 15-minute transmitted data with DCP log and SDR log as backup. A pressure transducer was setup and used for periods when gage was isolated or frozen. Record is complete and reliable. The stage-discharge relation was affected by ice Oct 26-29, 2010, Nov. 11, 2010 through Mar. 15, 2011. Nine unit values were estimated during instrumentation upgrade on August 18, 2011 without loss of accuracy. There were five instrument corrections made to the shaft encoder, ranging from -0.01 ft to +0.02 ft. These corrections were prorated by time from previous visits except for the correction made before measurement 167, which was re-corrected after measurement.
Datum Corrections.--	Levels were not shot this year. Levels were last shot on Aug. 6, 2010 using B.M. No. 4 as base. The RP was within allowable limits therefore no correction was made.
Rating.--	Low and medium water control is a wide cobble bar approximately 250 feet below the gage. High water control is the island in the river channel approximately 350 feet below the gage. Rating No. 5, created November 2010, was used again this water year. It is well defined from 90 to 3450 cfs. Seventeen measurements (No. 164 to 180) were made this year, ranging in discharge from 100 to 2800 cfs. They cover the range experienced except for the lower daily flows on Jan. 1-5, 11, Feb. 2, 3, 9, 10, Mar. 1, 2011 and the higher daily flows on Jun. 6, 7, 2011. The peak flow of 3170 cfs occurred at 0400 on June 7, 2011 at a gage height of 4.20 ft with a shift of +0.06 ft. The peak flow exceeded high measurement No. 175 (GH = 3.99), made June 6, 2011, by 0.21 ft in stage.
Discharge.--	Shifting-control method was used for all periods of good record. The stage-discharge relation was affected by ice and discharge estimated on Oct 26-29, 2010, Nov. 11, 2010 through Mar. 15, 2011. Shifts were applied as defined by measurements and distributed by time. Some of the shifting is actually the result of drawdown as determined by comparison of outside staff measurements with inside drop-tape measurements. Measurement shifts ranged from -0.07 to +0.11 feet. All measurements were given full weight except Nos. 164, 165, 172-174, 176, 177 and 179, which were adjusted as much as 5% to smooth shift distribution.
Special Computations.--	A pressure transducer was installed at this site and used during the winter months to aid with winter estimation. Winter estimates were determined based on streamflow measurements, hydrographic comparison with RIODELCO and weather records from RIOSFKCO.
Remarks.--	Record is good except for periods of ice affected record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	Continue to evaluate difference between outside staff gage measurements and inside drop-tape measurements and possibly better baffle inlets to reduce drawdown. Run levels to outside staff gage.

STATE OF COLORADO
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08217500 RIO GRANDE RIVER AT WAGON WHEEL GAP

RATING TABLE-- RIOWAGCO05 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

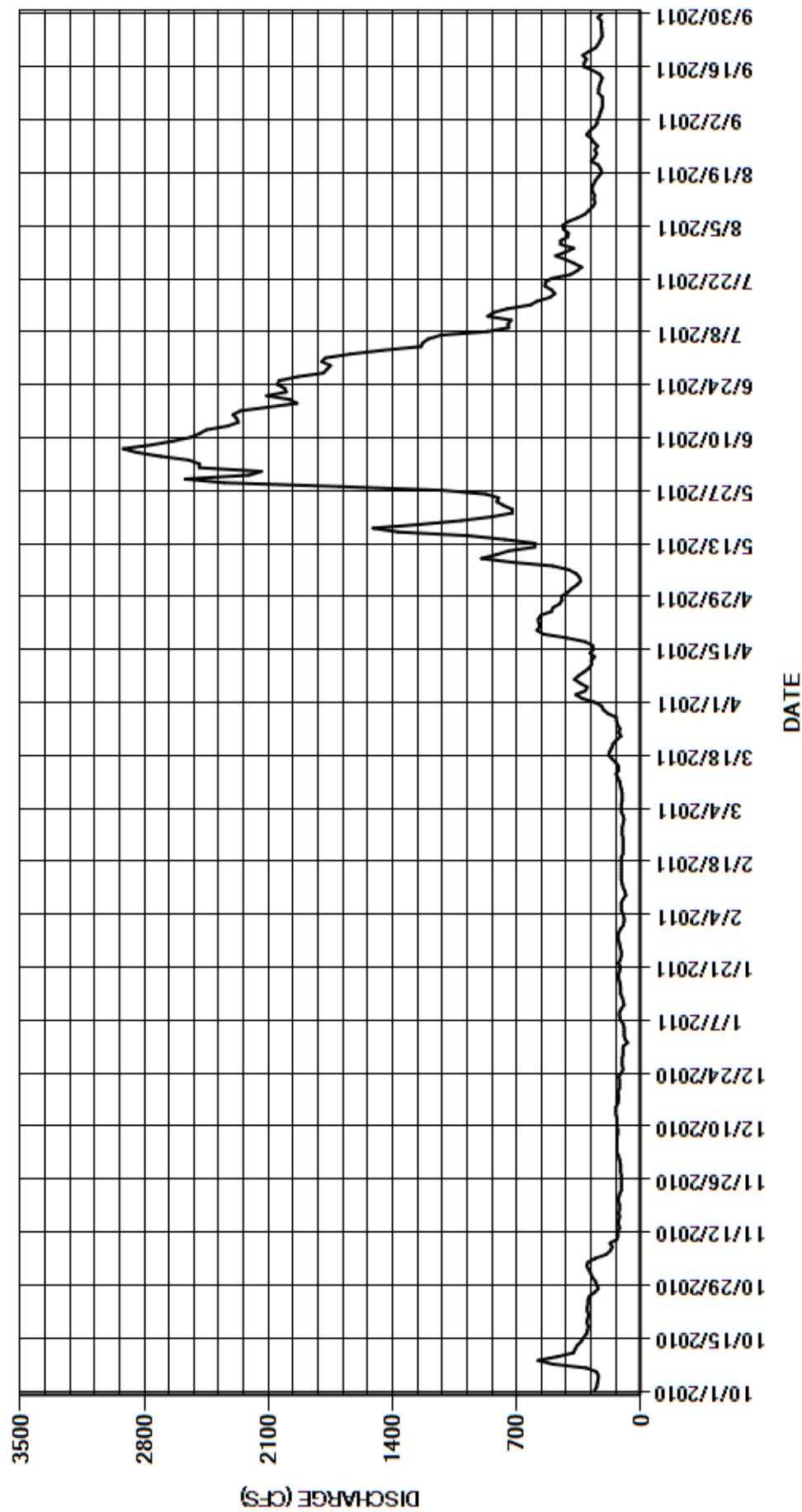
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	262	283	e120	e75	e100	e95	262	391	2140	1780	453	246
2	249	294	e125	e90	e95	e100	332	360	2490	1640	412	245
3	245	306	e135	e95	e95	e110	367	339	2490	1460	409	233
4	241	298	e135	e95	e100	e110	313	346	2550	1240	435	228
5	239	256	e135	e95	e110	e110	302	365	2710	1230	441	219
6	250	196	e135	e100	e110	e105	342	407	2840	1200	412	216
7	307	172	e135	e115	e110	e105	374	497	2920	1130	358	216
8	494	161	e130	e120	e100	e105	351	726	2760	863	316	218
9	580	174	e130	e120	e85	e110	320	899	2640	746	293	239
10	471	134	e135	e110	e90	e115	293	814	2540	749	272	238
11	381	e130	e135	e95	e100	e120	277	744	2490	731	258	234
12	370	e130	e135	e100	e105	e130	280	598	2450	864	265	226
13	359	e120	e140	e105	e110	e140	261	596	2330	832	261	218
14	337	e125	e140	e115	e110	e125	287	766	2270	752	273	232
15	324	e125	e140	e115	e110	e125	267	973	2280	623	276	272
16	307	e120	e130	e115	e110	140	273	1370	2300	585	265	321
17	301	e125	e125	e120	e110	162	315	1510	2260	513	255	319
18	296	e120	e125	e125	e110	182	419	1240	2100	485	238	307
19	304	e120	e130	e125	e110	175	549	1010	1940	504	220	327
20	300	e125	e120	e120	e100	164	586	842	1980	541	228	293
21	294	e125	e120	e115	e100	157	569	724	2110	539	240	255
22	301	e120	e120	e125	e100	138	576	726	2000	504	280	239
23	302	e110	e125	e115	e100	112	578	775	2010	398	261	229
24	298	e110	e110	e110	e100	124	563	812	2050	361	249	218
25	298	e110	e100	e110	e105	118	503	802	2040	334	260	220
26	e290	e110	e105	e115	e105	131	496	874	1940	376	244	221
27	e260	e110	e105	e120	e105	137	458	1120	1790	424	265	224
28	e240	e115	e105	e125	e100	139	444	1700	1770	480	280	222
29	e250	e115	e100	e130	---	186	448	2350	1750	424	306	242
30	257	e115	e100	e125	---	211	413	2570	1800	379	289	220
31	274	---	e100	e115	---	222	---	2210	---	452	263	---
TOTAL	9681	4654	3825	3455	2885	4203	11818	29456	67740	23139	9277	7337
MEAN	312	155	123	111	103	136	394	950	2258	746	299	245
AC-FT	19200	9230	7590	6850	5720	8340	23440	58430	134400	45900	18400	14550
MAX	580	306	140	130	110	222	586	2570	2920	1780	453	327
MIN	239	110	100	75	85	95	261	339	1750	334	220	216
CAL YR	2010	TOTAL	172723	MEAN	473	MAX	3090	MIN	70	AC-FT	342600	
WTR YR	2011	TOTAL	177470	MEAN	486	MAX	2920	MIN	75	AC-FT	352000	

MAX DISCH: 3170 CFS AT 04:00 ON JUN 07,2011 GH 4.20 FT SHIFT 0.06 FT

MAX GH: 4.20 FT AT 04:00 ON JUN 07,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08217500 RIO GRANDE RIVER AT WAGON WHEEL GAP
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08218500 GOOSE CREEK AT WAGONWHEEL GAP
Water Year 2011

Location.--	Lat 37°45'7", long 106°49'47" referenced to North American Datum of 1983 (Wagon Wheel Gap, CO quad, scale 1:24,000), UTM Zone 13 338810 E and 4179860 N, in SW ¼ SE ¼ sec. 35, T.41 N., R.1 E., New Mexico Principal Meridian, Mineral County, CO, Hydrologic Unit 13010001, on left bank 1/4 mi downstream from Pierce Creek, 1 mi upstream from mouth, 1 mi south of Wagon Wheel Gap, CO, and 8 3/4 mi southeast of Creede, CO.
Drainage Area and Period of Record.--	Approximately 90 mi ² . June 1954 to current year.
Equipment.--	Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger) and a float-operated shaft encoder in a 36-inch corrugated metal pipe shelter and concrete well. The shaft encoder float is operated in an oil cylinder. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No change.
Hydrologic Conditions.--	Streamflow is partially regulated by upstream reservoir. Drainage area is predominantly undeveloped National Forest. Much of this year had rapidly rising and falling stage due to issues related to bringing new hydro-plant online on Humphrey's reservoir.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Dec. 31, 2010 to Jan 11, 2011 when ice in well was affecting oil cylinder, and Jan. 12 through Mar. 21, 2011 when the station was closed for winter. Stage-discharge relation was affected by ice Oct. 28, Nov. 10-14, 16, 18, 19, 22-30, Dec. 1-14, 18, 19, 24-30, 2010, and March 23, 24, 2011. Missing record on December 23 was filled from DCP log with no loss of accuracy. There were two instrument corrections made to the shaft encoder, -0.01 ft and a +0.01 ft, which were prorated from previous measurements.
Datum Corrections.--	Levels were not shot this year. Levels were last run to the Reference Point (RP) inside the gage on Aug. 6, 2010 using B.M. 2 as base. The RP elevation was within allowable limits; therefore, no corrections were required or made.
Rating.--	Control is a rock and boulder riffle just downstream from the gage. Willows along banks influence high stages. Scouring, filling, and moss cause shift variations. Rating No. 10-1 was created in WY 2009. The rating is well defined from 20 to 330 cfs. The rating was re-evaluated at the upper and lower end. There was a change between 2004 and 2005 that caused the rating to shift negative off historic ratings. Eighteen measurements (Nos. 62-79) were made this year ranging in discharge from 15.6 to 255 cfs. They cover the range of flow experienced except for lower daily flows on Jan. 1-3, Feb. 2, 3, 2011 and the higher daily flows on June 6-8. The peak flow of 343 cfs occurred at 23:30 on June 6, 2011 at a gage height of 3.74 feet with a shift of 0.00 feet. It exceeded high measurement No. 74 (GH=3.51 ft), made June 6, 2011 by 0.23 feet in stage.
Discharge.--	Shifting-control method was used for all periods of good record. Shifts were applied as defined by measurements and were distributed by time. Stage-discharge relation was affected by ice and discharge estimated on Oct. 28, Nov. 10-14, 16, 18, 19, 22-30, Dec. 1-14, 18, 19, 24-30, 2010, and March 23, 24, 2011. Measurements show shifts varied from -0.04 to +0.08 ft. All open water measurements were given full weight except Nos. 75 and 76, which were adjusted as much as 6% to smooth shift distribution.
Special Computations.--	Discharge for periods of no gage-height and ice affected record was estimated using discharge measurements, air temperature record from South Fork Rio Grande River at South Fork, and hydrographic comparison with Rio Grande River near Del Norte and Rio Grande River at Wagon Wheel Gap.
Remarks.--	Record is good to fair except for periods of no gage-height and ice affected record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08218500 GOOSE CREEK AT WAGONWHEEL GAP

RATING TABLE-- GOOWAGCO10-1 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

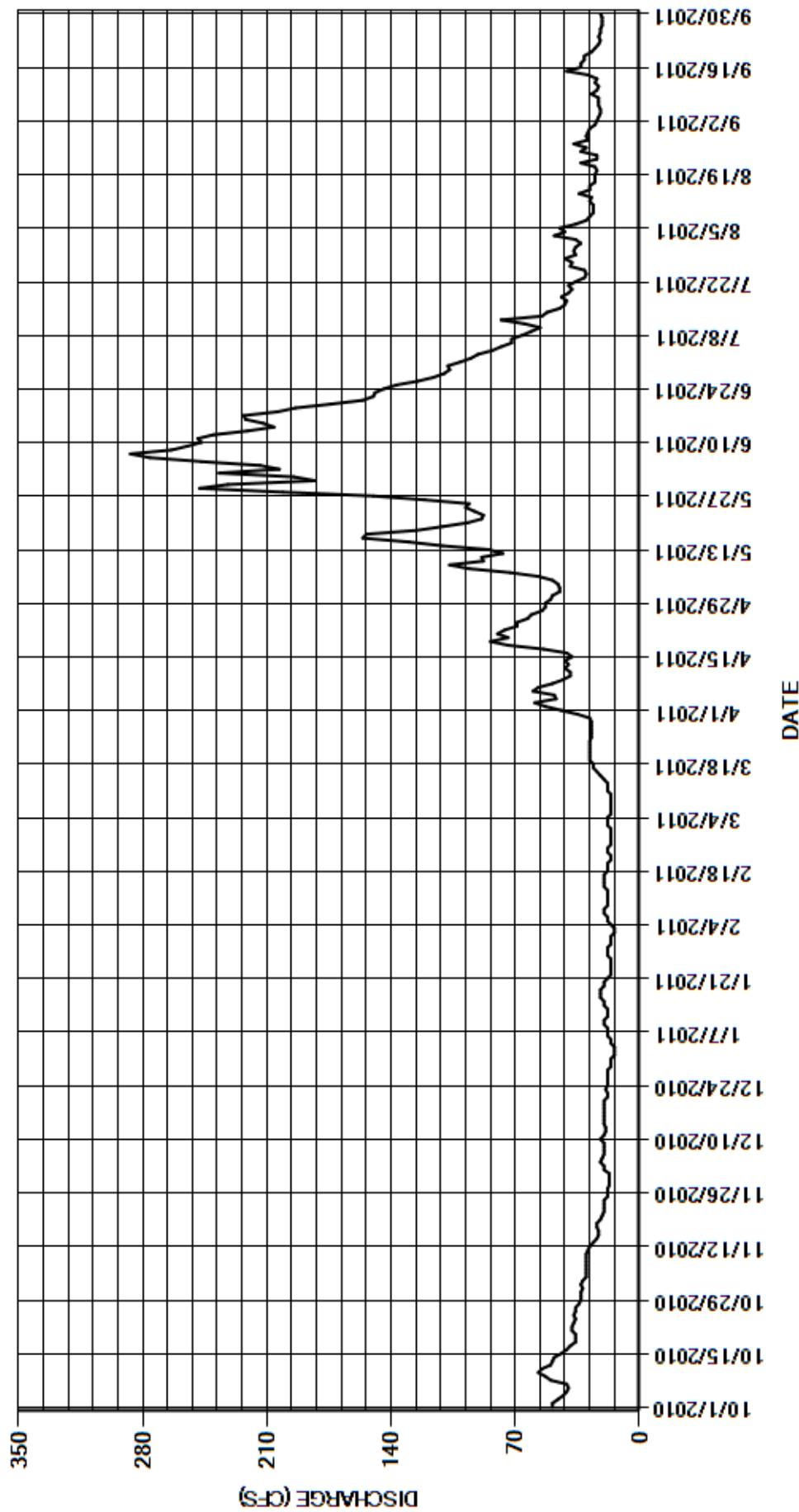
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	49	32	e17	e14	e16	e16	44	49	195	101	33	25
2	49	33	e20	e14	e14	e18	53	45	237	95	36	24
3	46	32	e20	e14	e14	e18	59	45	203	91	48	23
4	43	30	e22	e16	e16	e18	47	46	214	83	42	22
5	41	30	e21	e16	e18	e16	48	49	247	78	45	22
6	40	30	e20	e18	e18	e16	60	57	276	72	36	23
7	41	30	e20	e18	e20	e16	57	73	287	72	30	23
8	50	30	e20	e18	e20	e16	49	96	264	66	28	23
9	53	30	e20	e20	e18	e16	43	107	255	61	26	27
10	57	e30	e22	e20	e18	e16	39	88	247	56	26	24
11	55	e29	e20	e18	e18	e18	39	89	249	65	26	23
12	50	e28	e19	e18	e18	e18	42	77	240	78	28	25
13	49	e26	e19	e18	e18	e18	40	85	221	55	27	24
14	48	e24	e20	e20	e20	e20	42	111	206	52	34	29
15	44	23	20	e20	e20	e22	38	130	212	45	28	41
16	41	e23	20	e22	e20	e24	41	156	222	42	28	33
17	39	24	20	e22	e20	e26	54	154	223	41	25	33
18	36	e24	e20	e22	e18	e26	74	126	204	44	25	31
19	36	e22	e20	e20	e18	e28	84	111	194	40	25	31
20	36	21	20	e20	e18	e28	74	97	174	38	24	27
21	38	20	18	e18	e16	e28	80	89	156	40	25	25
22	38	e20	18	e16	e16	28	76	88	150	36	33	23
23	37	e20	19	e16	e18	e28	69	93	149	31	24	22
24	36	e20	e18	e16	e18	e28	69	98	144	30	24	23
25	37	e18	e18	e16	e16	27	63	96	137	31	33	22
26	36	e18	e18	e16	e16	27	61	121	125	39	30	22
27	36	e18	e18	e18	e16	27	55	150	116	38	37	21
28	e34	e17	e18	e18	e16	27	53	201	110	42	29	21
29	33	e17	e16	e18	---	27	53	248	107	36	30	21
30	33	e17	e16	e16	---	28	50	232	108	37	29	22
31	33	---	e16	e16	---	35	---	183	---	36	28	---
TOTAL	1294	736	593	552	492	704	1656	3390	5872	1671	942	755
MEAN	41.7	24.5	19.1	17.8	17.6	22.7	55.2	109	196	53.9	30.4	25.2
AC-FT	2570	1460	1180	1090	976	1400	3280	6720	11650	3310	1870	1500
MAX	57	33	22	22	20	35	84	248	287	101	48	41
MIN	33	17	16	14	14	16	38	45	107	30	24	21
CAL YR	2010	TOTAL	22074	MEAN	60.5	MAX	392	MIN	10	AC-FT	43780	
WTR YR	2011	TOTAL	18657	MEAN	51.1	MAX	287	MIN	14	AC-FT	37010	

MAX DISCH: 343 CFS AT 23:30 ON JUN 06,2011 GH 3.74 FT SHIFT 0 FT

MAX GH: 3.74 FT AT 23:30 ON JUN 06,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08218500 GOOSE CREEK AT WAGONWHEEL GAP
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08219500 SOUTH FORK RIO GRANDE RIVER AT SOUTH FORK
Water Year 2011

Location.--	Lat 37°39'34", long 106°38'55" referenced to North American Datum of 1983 (South Fork West, CO quad, scale 1:24,000), UTM Zone 13 354589 E and 4169323 N, in NW ¼ NE ¼ sec. 3, T.39 N., R.3 E., New Mexico Principal Meridian, Rio Grande County, CO, Hydrologic Unit 13010001, on left bank near U.S. Highway 160, 0.1 mi downstream from Church Creek, 0.9 mi southwest of South Fork, CO, and 1.5 mi upstream from mouth.
Drainage Area and Period of Record.--	216 mi ² (from topographic maps). 1910 to current year.
Equipment.--	Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), a float-operated shaft encoder, air temperature sensor, and tipping-bucket rain gauge in a timber shelter and corrugated metal pipe well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. Cableway is located 475 feet upstream. Chart recorder removed, shaft encoder replaced with Sutron SDR, and DCP upgraded to Sutron Satlink2 on Aug. 18, 2011.
Hydrologic Conditions.--	Transmountain diversion from Colorado River Basin through Treasure Pass Ditch and into Rio Grande Basin above station. A few small diversions for irrigation, slight regulation by Beaver Creek Reservoir (capacity, 4,760 acre-ft.), and several smaller storage reservoirs.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup. After Aug. 18, DCP log and SDR log as backup. Record is complete and reliable except Dec. 14, 2010 through Mar. 22, 2011 when the station was closed for the winter. The stage-discharge relation was affected by ice Oct. 26-29, Nov. 12-30, Dec 1-13, 2010. One erroneous unit value was corrected on Aug. 3 and 7 missing and 2 erroneous unit values were estimated on Aug. 18, 2011 when equipment was being upgraded. There were two instrumentation corrections made to the shaft encoder; +0.01 feet on Dec. 14, 2010 and +0.01 feet on July 12, 2011, which were prorated back to the previous visit.
Datum Corrections.--	Levels were not shot this year. Levels were last shot to reference point (RP) inside gage on Aug. 6, 2010 using BM 7 as base. The RP elevation was correct, but the nonadjustable tape length was 0.02 ft too long. Therefore the RP was adjusted to match the tape length, resulting in a -0.02 feet datum correction.
Rating.--	A cobble bar approximately 250 feet downstream from the gage is the control. This cobble bar results in a significant flow split at higher gage heights. Shifting is caused by channel scour and fill and also vegetation and debris deposition associated with the cobble bar island. Rating No. 11 was used again this year. The slope of the rating in log-log space indicates that section control governs discharge at most stages. It is fairly well defined from 34 to 2700 cfs. Seventeen measurements (Nos. 261-277) were made this year ranging in discharge from 34.0 to 905 cfs. They cover the discharge range experienced except for higher daily flows on May 29, 30, June 1-11, 2011 and the lower daily flows on Dec. 31, 2010, Jan. 1, 2, 10, 11, 25-27, 30, 31, Feb. 1-4, 9, 10, 2011. The peak flow of 1290 cfs occurred at 2345 on June 6, 2011 at a gage height of 4.89 feet with a shift of -0.03 ft. It exceeded high measurement No. 272 (GH=4.25), made June 6, 2011 by 0.64 feet in stage.
Discharge.--	Shifting control method was used during all open water periods. The stage-discharge relation was affected by ice and discharge estimated Oct. 26-29, Nov. 12-30, Dec 1-13, 2010. A variable shift curve VS11-1 was developed and used to define the stage-shift relation from Mar. 22 to Aug. 25, 2011. The curve was left open-ended due to the shift trend not indicating a return to rating. During other periods, shifts were applied as defined by measurements and distributed by time. Measured shifts varied from -0.03 feet to +0.10 feet. All were given full weight and applied, except Nos. 261, 270, 274, 275 and 277, which were adjusted as much as 6.5% to smooth shift distribution.
Special Computations.--	Discharge for periods of no gage-height and ice affected record was estimated using discharge measurements, comparison with flows at Rio Grande near Del Norte, Rio Grande near Wagon Wheel Gap, Goose Creek at Wagon Wheel Gap, and weather records.
Remarks.--	Record is good except for periods of no gage-height and ice affected record, which are estimated and poor. Station maintained and records developed by Div 3 hydrographic staff.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08219500 SOUTH FORK RIO GRANDE RIVER AT SOUTH FORK

RATING TABLE-- RIOSFKCO11 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

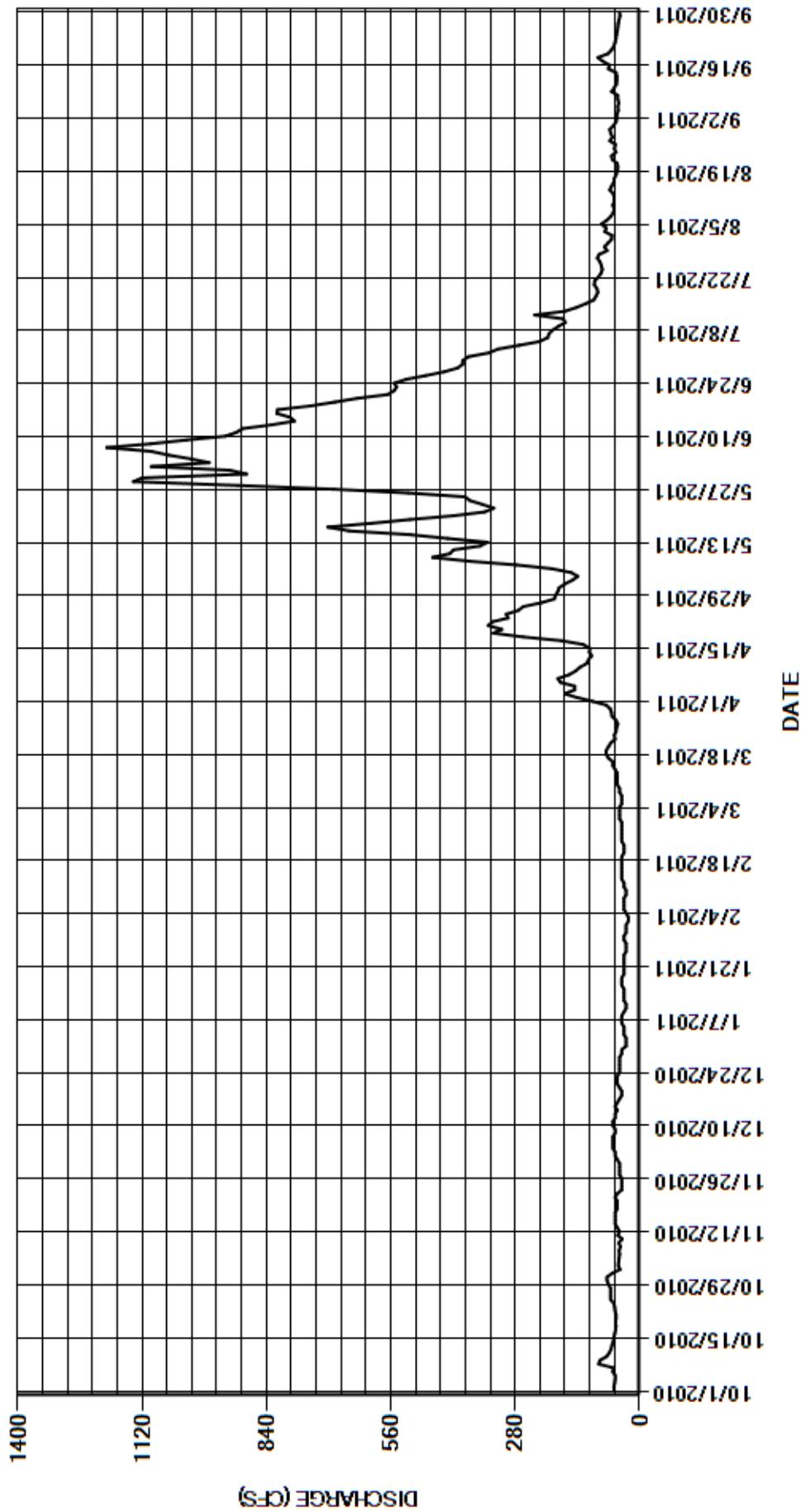
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	57	61	e50	e30	e30	e45	106	181	922	385	63	53
2	58	44	e55	e30	e25	e45	141	168	1100	339	62	51
3	56	48	e55	e35	e25	e45	169	151	969	319	78	51
4	55	47	e60	e35	e30	e45	146	139	1010	271	75	48
5	55	46	e60	e35	e35	e40	146	154	1060	225	86	49
6	60	45	e60	e40	e35	e40	178	197	1100	207	74	47
7	59	46	e60	e40	e35	e40	184	277	1200	204	65	49
8	92	43	e55	e40	e35	e45	159	383	1100	196	59	49
9	89	47	e55	e35	e30	e45	144	466	1020	183	57	63
10	74	39	e60	e30	e30	e50	134	427	933	167	60	57
11	68	49	e60	e30	e35	e50	119	419	908	172	57	52
12	64	e45	e55	e35	e35	e50	115	359	894	236	57	51
13	62	e50	e55	e35	e40	e50	108	342	828	168	59	51
14	59	e55	e50	e35	e40	e55	113	432	777	142	67	53
15	58	e55	e55	e35	e40	e60	112	517	787	121	63	70
16	56	e55	e50	e40	e40	e60	127	654	817	103	58	68
17	54	e55	e45	e40	e40	e70	176	702	815	98	57	83
18	53	e50	e40	e40	e40	e75	262	603	741	94	53	94
19	54	e50	e40	e35	e40	e75	329	517	687	96	50	71
20	53	e50	e45	e35	e35	e70	310	419	635	102	49	63
21	53	e55	e50	e35	e35	e65	341	349	567	101	50	58
22	55	e50	e50	e35	e35	e55	331	328	553	93	61	55
23	56	e40	e50	e35	e40	57	296	354	547	87	63	53
24	58	e40	e45	e35	e40	53	300	382	552	84	53	52
25	65	e40	e45	e30	e40	52	273	393	526	86	57	50
26	e65	e40	e45	e30	e40	49	262	521	482	89	54	49
27	e65	e45	e45	e30	e40	53	222	688	440	95	67	48
28	e65	e45	e45	e35	e40	62	192	904	410	91	61	46
29	e70	e45	e40	e35	---	63	189	1140	398	73	65	44
30	73	e45	e40	e30	---	66	184	1120	398	79	67	45
31	73	---	e30	e30	---	75	---	885	---	71	59	---
TOTAL	1934	1425	1550	1070	1005	1705	5868	14571	23176	4777	1906	1673
MEAN	62.4	47.5	50.0	34.5	35.9	55.0	196	470	773	154	61.5	55.8
AC-FT	3840	2830	3070	2120	1990	3380	11640	28900	45970	9480	3780	3320
MAX	92	61	60	40	40	75	341	1140	1200	385	86	94
MIN	53	39	30	30	25	40	106	139	398	71	49	44
CAL YR	2010	TOTAL	66823	MEAN	183	MAX	1370	MIN	30	AC-FT	132500	
WTR YR	2011	TOTAL	60660	MEAN	166	MAX	1200	MIN	25	AC-FT	120300	

MAX DISCH: 1290 CFS AT 23:45 ON JUN 06,2011 GH 4.89 FT SHIFT -0.03 FT

MAX GH: 4.89 FT AT 23:45 ON JUN 06,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08219500 SOUTHFORK RIO GRANDE RIVER AT SOUTHFORK
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08220000 RIO GRANDE RIVER NEAR DEL NORTE, CO
Water Year 2011

Location.--	Lat 37°41'22", long 106°27'38" referenced to North American Datum of 1983 (Indian Head, CO quad, scale 1:24,000), UTM Zone 13 371224 E and 4172363 N, in NE ¼ NE ¼ sec. 30, T.40 N., R.5 E., New Mexico Principal Meridian, Rio Grande County, CO, Hydrologic Unit 13010001, on right bank 40 ft downstream from county road 17 (Twin Mountain) bridge, 5 mi upstream from Pinos Creek, and 6 mi west of Del Norte, CO
Drainage Area and Period of Record.--	1,320 mi ² (furnished by State Engineer of Colorado). June 1889 to current year. Monthly discharge only for some periods.
Equipment.--	Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio and phone modem) and a float-operated shaft encoder, air temperature sensor, water temperature sensor, and tipping bucket rain gauge in a 6 ft by 6 ft exposed aggregate building with a 4 ft diameter concrete well. The primary reference gage is a drop tape from reference point on shelf. Cableway located 1500 feet above gaging station. Outside staff gage installed during WY2010, but is impossible to read with accuracy. On July 15, 2011 the new outside chain gage was functional at the station.
Hydrologic Conditions.--	Natural flow of stream affected by storage reservoirs, transmountain diversions from Colorado River Basin, diversions for irrigation and municipal use, groundwater withdrawals, return flows from irrigated areas, and flows from sewage-treatment plants. Flow regulated by Beaver Creek Reservoir since 1910, Santa Maria Reservoir since 1912, Rio Grande Reservoir since 1912, and Continental Reservoir since 1925, combined capacity, 126,100 acre-ft, and by several smaller reservoirs.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except 3 15-minute values were filled September 6 from chart record due to missing satellite transmission without loss of accuracy. The stage-discharge relation was affected by ice Nov. 22, 2010 through Mar. 15, 2011. No instrumentation corrections were made to the shaft encoder during the year.
Datum Corrections.--	Levels were ran Sep. 1, 2011 to the Reference Point (RP) inside the gage using BM #6 as base. The RP was within allowable limits, so no correction was made.
Rating.--	Low water control is a wide cobble bar 250 feet below the gage. High water control is the river channel. The channel splits at control section. At gage-heights below approximately 1.00 foot, all water flows in left channel. Rating No. 4, in use since March 15, 2007, was used again this year. It is well defined from 53 to 9000 cfs. This rating was extended to 12,500 cfs using data acquired from a USGS cooperative rating curve extension project completed in 2003. Thirty measurements (Nos. 164-193) were made this year, ranging in discharge from 157 to 3830 cfs. They cover the discharge range experienced except for the lower daily flows on Feb. 2, 3, 9, 10, 2011 and higher daily flows on June 6-8, 2011. The peak flow of 4440 cfs occurred at 0900 on June 7, 2011 at a gage height of 4.18 feet with a shift of -0.09 feet. It exceeded high measurement No. 185 made at a GH of 3.90, made June 6, 2011 by 0.28 feet in stage.
Discharge.--	Shifting control method was used during all periods of good record; the period November 22, 2010 through Mar. 15, 2011 was estimated because the stage-discharge relation was affected by ice. Shifts were applied as defined by discharge measurements and distributed by time, except for the period of May 2 through July 15, 2011 when the shift curve RIODELVS11-2 was used to apply shifts by stage. Open water measurements show shifts varied between -0.10 and +0.05 ft. All measurements were given full weight except Nos. 179, 182-184, 189-191 and 193, which were adjusted as much as 4 percent to smooth shift distribution.
Special Computations.--	Discharge for periods of ice-affected record was based on eight measurements, partial day records, weather records, and comparison with nearby stations. The calculated discharge values on Oct. 1, 6, 10, 13, 17, 21, 23, 24, 31, Nov. 5, 11, 13, 14, 20, 2010 were adjusted by +/- 1 cfs in order for the 2011 Water Year values to match the final 2010 Calendar Year values. The small discrepancies are due to mathematical differences between the old system using hourly average values and the new system using 15-minute unit values for the daily mean discharge calculation.
Remarks.--	Record is good except for periods of ice affected record, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08220000 RIO GRANDE RIVER NEAR DEL NORTE, CO

RATING TABLE-- RIODELCO04 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

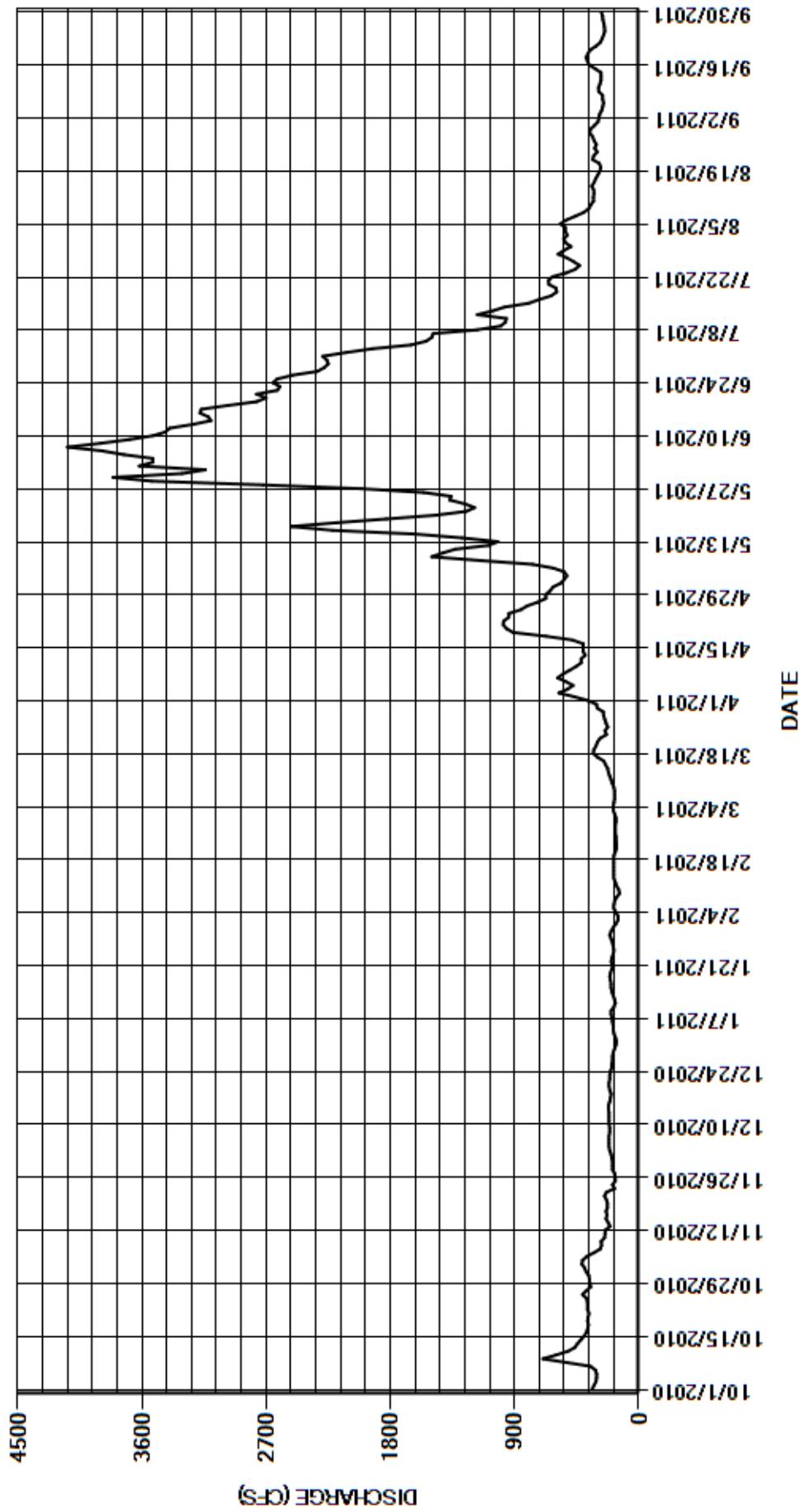
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	337	382	e195	e160	e165	e165	368	622	3140	2290	544	295
2	324	392	e200	e170	e150	e175	467	565	3620	2120	519	289
3	309	412	e210	e180	e150	e185	578	540	3520	1930	531	283
4	306	408	e215	e185	e165	e185	516	521	3520	1650	531	269
5	305	378	e215	e185	e180	e180	476	539	3730	1540	569	261
6	314	327	e215	e190	e180	e175	528	618	3890	1500	526	255
7	349	280	e215	e195	e175	e175	588	769	4140	1490	462	262
8	520	269	e210	e200	e160	e175	549	1140	3900	1170	400	262
9	695	273	e210	e200	e140	e180	501	1500	3690	1000	363	290
10	599	248	e215	e180	e145	e190	455	1420	3520	967	348	292
11	512	244	e215	e170	e160	e200	416	1330	3430	959	328	281
12	463	243	e215	e175	e170	e210	418	1090	3400	1170	329	273
13	444	208	e215	e185	e180	e220	388	1020	3230	1060	325	272
14	420	222	e220	e195	e180	e225	404	1280	3100	973	327	274
15	396	237	e220	e200	e180	e240	402	1620	3120	798	340	315
16	379	230	e210	e200	e180	253	402	2220	3180	722	323	359
17	370	237	e205	e205	e180	298	480	2520	3170	634	311	371
18	365	226	e200	e210	e180	329	672	2190	2980	595	296	382
19	371	226	e210	e205	e180	326	911	1830	2770	599	281	368
20	367	234	e215	e195	e170	309	958	1470	2700	651	276	351
21	361	248	e215	e190	e160	300	983	1250	2770	654	286	309
22	371	e235	e210	e200	e160	280	979	1190	2620	627	335	278
23	370	e175	e210	e195	e165	234	942	1260	2600	529	326	265
24	372	e190	e205	e185	e165	245	942	1370	2650	460	301	254
25	379	e170	e195	e180	e170	225	855	1360	2620	429	319	246
26	407	e170	e195	e185	e170	237	810	1560	2510	471	307	249
27	379	e175	e190	e190	e170	246	733	2010	2330	520	324	253
28	348	e190	e190	e200	e165	255	673	2720	2280	584	333	260
29	355	e190	e185	e210	---	257	674	3530	2250	542	355	262
30	357	e190	e175	e200	---	301	642	3810	2260	491	351	272
31	362	---	e165	e185	---	306	---	3310	---	530	321	---
TOTAL	12206	7609	6360	5905	4695	7281	18710	48174	92640	29655	11487	8652
MEAN	394	254	205	190	168	235	624	1554	3088	957	371	288
AC-FT	24210	15090	12620	11710	9310	14440	37110	95550	183800	58820	22780	17160
MAX	695	412	220	210	180	329	983	3810	4140	2290	569	382
MIN	305	170	165	160	140	165	368	521	2250	429	276	246
CAL YR	2010	TOTAL	271926	MEAN	745	MAX	5000	MIN	120	AC-FT	539400	
WTR YR	2011	TOTAL	253374	MEAN	694	MAX	4140	MIN	140	AC-FT	502600	

MAX DISCH: 4440 CFS AT 09:00 ON JUN 07,2011 GH 4.18 FT SHIFT -0.09 FT

MAX GH: 4.18 FT AT 09:00 ON JUN 07,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08220000 RIO GRANDE RIVER NEAR DEL NORTE, CO
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08220500 PINOS CREEK NEAR DEL NORTE
Water Year 2011

Location.--	Lat 37°35'30", long 106°27'0" referenced to North American Datum of 1983 (Horseshoe Mountain, CO quad, scale 1:24,000), UTM Zone 13 371984 E and 4161500 N, in SW ¼ SE ¼ sec. 29, T.39 N., R.5 E., New Mexico Principal Meridian, Rio Grande County, CO, Hydrologic Unit 13010002, on left bank 200 ft downstream from Bennett Creek and 8 mi southwest of Del Norte, CO.
Drainage Area and Period of Record.--	53 mi ² . 1919 to 1924, May 1, 1936 to current year.
Equipment.--	Graphic water stage recorder, data collection platform (Sutron Satlink2), and a float-operated SDR in a 3 ft by 3 ft timber shelter and concrete well at a 12-foot rectangular concrete box control with a steel triangular ramp on each side of the concrete box at the discharge end. The primary reference gage is a drop tape from reference point on shelf. A supplemental outside staff gage is located in the concrete box.
Hydrologic Conditions.--	Drainage is composed of light development, alpine and sub-alpine conditions. Flows are affected by Fuchs Reservoir and one small diversion upstream.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and SDR log as backup. Record is complete and reliable except for Nov. 16, 2010 to Mar. 22, 2011 when the station was closed for the winter. Two unit values were adjusted on Jun. 3 and one unit value was adjusted on Jun. 21 due to hydro affecting gage-height. Stage-discharge relation was affected by ice Oct. 26–29, Nov. 10–15, 2010, and Mar. 23–27, 2011. There were two shaft encoder corrections of -0.01 feet. These were prorated by time from previous visit. One +0.01 ft shaft encoder correction was applied during measurement. One -0.01 ft cleaning correction was applied as a shift correction by prorating from previous visit.
Datum Corrections.--	Levels were not ran at the station this year. Levels were last run to the Reference Point (RP) inside the gage on August 6, 2010 using B.M. No. 3 as base. The RP elevation was within allowable limits, so no correction was made.
Rating.--	The control is a 12 ft wide, 12 ft long, 5 ft high concrete box flume with a steel triangular ramp on each side of the concrete box at the discharge end. Minor shifting occurs mainly due to changes in approach conditions, spalling of the concrete, and movement of streambed materials through the box. Rocks, trees, and approach angle in the streambed above the gage also cause some shifting. Rating No. 15 was used for the entire water year. Sixteen measurements (Nos. 155–170) were made this year ranging in discharge from 4.64 to 57.9 cfs. They cover the discharge range experienced except for the lower daily flows on Dec. 31, 2010, Jan 1–6, 11, Feb. 2, 9, 10, 2011 and higher daily flows on May 27–30, Jun. 1–7, 2011. The peak flow of 196 cfs occurred at 1515 on Aug. 3, 2011 at a gage height of 2.38 feet with a shift of 0.00 feet. It exceeded high measurement No. 165 (GH=1.44 ft), made June 3, 2011 by 0.94 feet in stage.
Discharge.--	Shifting control method was used during all periods of good record. From Mar. 22, 2011 through the end of the water year, two variable shift curves were used to define the stage-discharge relationship defined by measurements with minor shifting at the low end caused by deposition of streambed material in flume. During other periods, shifts were applied as defined by measurements and distributed by time. Measurement shifts ranged from -0.01 to +0.04 feet. All were given full weight except Nos. 155, 163, 165, 166, and 170, which were adjusted by as much as 7% to smooth shift distribution. High measurement 165 was adjusted 3% to better fit the measurement trend and last year's measurements. The variable shift curves were taken back to the rating at 1.80 ft gage-height as defined by recent high flow measurements. Stage-discharge relation was affected by ice and discharge was estimated Oct. 26–29, Nov. 10–15, 2010, and Mar. 23–27, 2011.
Special Computations.--	Discharge for periods of no gage-height and ice affected record was estimated using discharge measurements and air temperature records from RIOSFKCO.
Remarks.--	Record is good except for periods of no gage-height and ice affected record, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08220500 PINOS CREEK NEAR DEL NORTE

RATING TABLE-- PINDELCO15 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

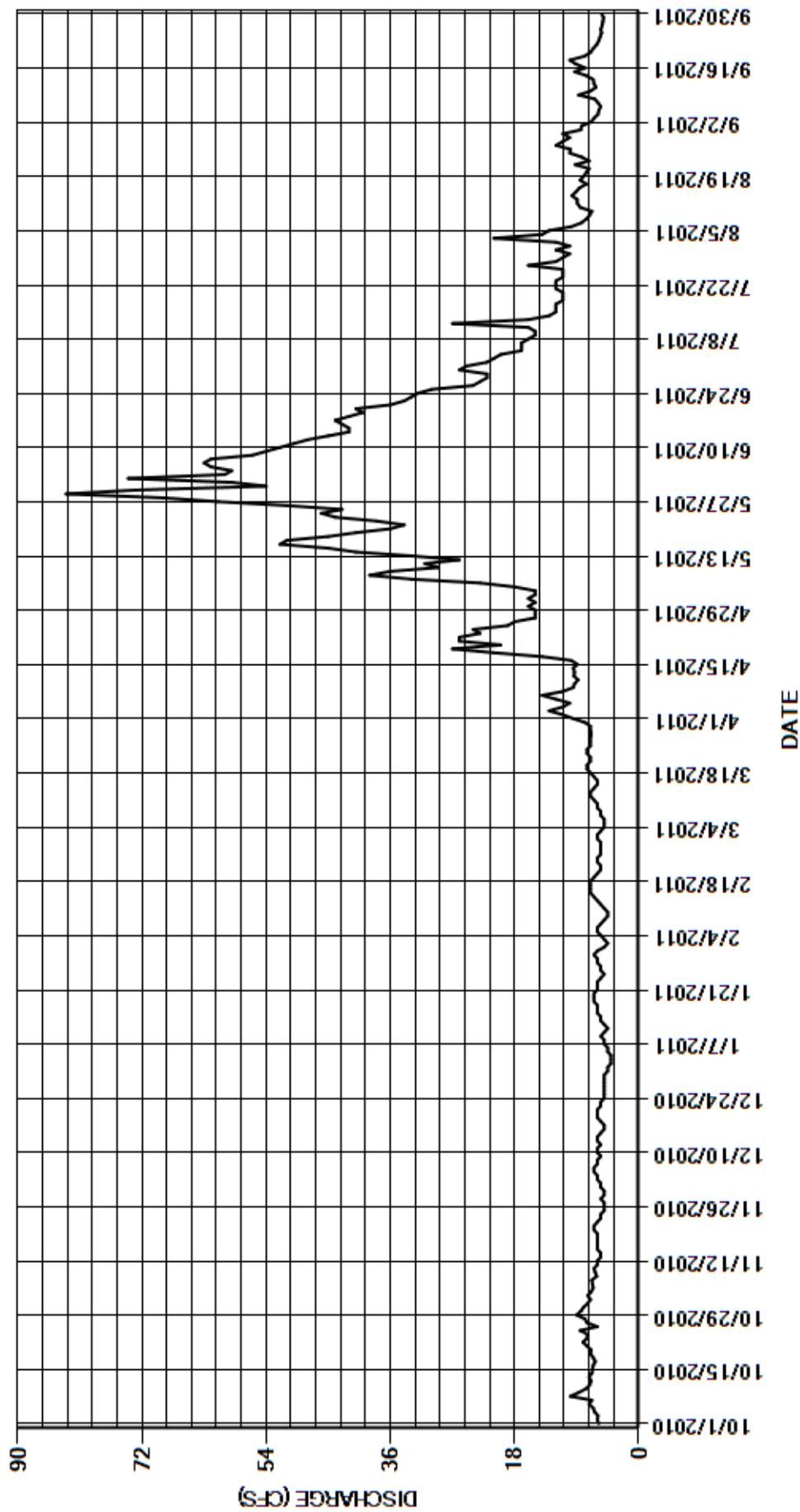
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.8	7.4	e5.5	e4.5	e5.0	e6.0	9.5	15	59	25	10	8.3
2	6.0	7.0	e5.5	e4.0	e4.5	e6.0	11	16	74	22	12	6.9
3	5.9	7.4	e6.0	e4.0	e5.0	e5.5	13	15	60	21	21	6.5
4	6.4	6.9	e6.0	e4.0	e5.5	e5.0	11	15	59	20	14	5.9
5	6.6	6.6	e6.5	e4.5	e6.0	e5.0	10	18	62	17	13	5.8
6	7.2	6.7	e6.5	e4.5	e6.0	e5.0	12	23	63	17	9.8	5.5
7	6.8	6.8	e6.0	e5.0	e5.5	e5.5	14	33	62	17	8.3	5.9
8	9.9	6.1	e6.0	e5.0	e5.0	e5.5	11	39	56	16	7.6	6.4
9	8.7	6.3	e5.5	e5.5	e4.5	e6.0	9.5	36	54	15	7.1	8.7
10	7.6	e6.5	e6.0	e5.0	e4.5	e6.0	9.3	29	52	15	6.8	7.0
11	7.1	e6.0	e6.0	e4.5	e5.0	e6.5	8.8	31	50	16	8.5	6.2
12	6.9	e6.0	e5.5	e5.0	e5.5	e7.0	9.4	26	48	27	8.9	6.5
13	7.2	e5.5	e6.0	e5.5	e6.0	e7.0	9.3	33	45	16	8.9	6.6
14	6.8	e5.5	e6.0	e5.5	e6.5	e6.5	9.5	41	42	13	9.7	7.6
15	6.7	e6.0	e5.5	e6.0	e7.0	e6.0	8.9	45	42	12	9.1	9.3
16	6.6	e6.0	e5.0	e6.0	e7.0	e6.0	9.8	52	43	12	8.6	7.8
17	6.3	e6.0	e5.0	e6.0	e7.0	e6.5	14	51	44	12	7.6	9.1
18	6.6	e6.0	e5.5	e6.5	e7.0	e7.0	21	45	42	11	8.5	10
19	7.0	e6.0	e6.0	e6.5	e6.5	e7.5	27	41	40	11	8.0	7.9
20	6.9	e6.5	e6.0	e6.5	e6.0	e7.5	20	36	41	11	7.6	7.0
21	7.5	e6.5	e6.0	e6.0	e5.5	e7.0	26	34	36	12	7.2	6.6
22	8.1	e6.0	e5.5	e6.0	e5.5	e7.0	26	38	34	12	9.2	6.1
23	7.5	e5.5	e5.5	e6.0	e6.0	e7.5	23	44	33	12	7.2	5.8
24	7.4	e5.5	e5.0	e5.5	e6.0	e7.5	24	46	32	11	8.3	5.6
25	8.5	e5.0	e5.0	e5.0	e5.5	e7.0	19	43	30	11	10	5.4
26	e6.0	e5.0	e5.0	e5.5	e5.5	e7.0	18	51	24	11	9.9	5.5
27	e7.5	e5.0	e5.0	e5.5	e5.5	e7.0	15	61	23	16	12	5.3
28	e7.8	e5.5	e5.0	e6.0	e5.5	6.9	15	69	22	12	11	5.2
29	e9.0	e5.0	e5.0	e6.0	---	7.0	15	83	22	11	10	5.1
30	8.4	e5.0	e5.0	e6.5	---	7.0	16	73	26	10	11	5.4
31	8.0	---	e4.5	e6.0	---	7.8	---	54	---	12	8.4	---
TOTAL	224.7	181.2	172.5	168.0	160.0	201.7	445.0	1236	1320	456	299.2	200.9
MEAN	7.25	6.04	5.56	5.42	5.71	6.51	14.8	39.9	44.0	14.7	9.65	6.70
AC-FT	446	359	342	333	317	400	883	2450	2620	904	593	398
MAX	9.9	7.4	6.5	6.5	7.0	7.8	27	83	74	27	21	10
MIN	5.8	5.0	4.5	4.0	4.5	5.0	8.8	15	22	10	6.8	5.1
CAL YR	2010	TOTAL	8630.8	MEAN	23.6	MAX	155	MIN	4.5	AC-FT	17120	
WTR YR	2011	TOTAL	5065.2	MEAN	13.9	MAX	83	MIN	4.0	AC-FT	10050	

MAX DISCH: 196 CFS AT 15:15 ON AUG 03,2011 GH 2.38 FT SHIFT 0 FT

MAX GH: 2.38 FT AT 15:15 ON AUG 03,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08220500 PINOS CREEK NEAR DEL NORTE
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08221500 RIO GRANDE RIVER AT MONTE VISTA
Water Year 2011

Location.--	Lat 37°36'34", long 106°8'56" referenced to North American Datum of 1983 (Monte Vista, CO quad, scale 1:24,000), UTM Zone 13 398597 E and 4163100 N, in NW ¼ SW ¼ sec. 19, T.39 N., R.8 E., New Mexico Principal Meridian, Rio Grande County, CO, Hydrologic Unit 13010002, on left bank 40 ft downstream from bridge on U.S. Highway 285, 2.0 mi north of Monte Vista, CO, and 12 mi downstream from San Francisco Creek.
Drainage Area and Period of Record.--	1,590 mi ² . May 1926 to current year.
Equipment.--	Graphic water stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), a float-operated shaft encoder, and a tipping-bucket rain gauge in a 72 inch corrugated metal shelter and well. The primary reference gage is a drop tape from reference point on shelf. Auxiliary outside staff gage installed on Mar. 18, 2011. The 8210 DCP and shaft encoder were replaced with Sutron Satlink2 and SDR on May 11, 2011.
Hydrologic Conditions.--	Watershed is comprised of valley floor and steep mountain headwaters. Headwaters areas are generally undeveloped with only sparse minimally populated areas. Valley floor is highly agriculturally based and flows from watershed are diverted for irrigation, livestock watering, domestic, commercial, recharge, and groundwater withdrawals. Flow at gage also includes return flows from all uses.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Jan. 2 - Mar. 9, 2011 when floats were affected by ice in well. There were three hours of missing data on May 11, 2011 due to upgrading equipment, which was estimated. Sep. 26, 28, 30 were each missing 1 to 2 unit values which were filled from chart. The stage-discharge relation was affected by ice Nov. 14, 2010 - Jan. 1, 2011, Mar. 10-12, 2011. There were two shaft encoder corrections, -0.01 ft on Oct. 29, 2010 and +0.01 ft on Mar. 9, 2011. Both were prorated by time from previous visit.
Datum Corrections.--	Levels were run to the Reference Point (RP) inside the gage on Jul. 28, 2011 using B.M. No. 3 as base. The RP elevation was within allowable limits, so a correction was not made. The outside staff gage was adjusted -0.06 ft. Two-peg tests were performed on the Lietz level (SN 130869) on May 27, Jul. 28, and Sep. 26, 2011. The instrument was adjusted slightly on Sep. 26, 2011.
Rating.--	Control at most stages is small cobble riffle approximately 500 ft. below gage. Low water control is a gravel and small cobble riffle 25 feet below the gage. There are two channels at gage during lower stages due to sedimentation behind bridge pier above gage. Rating No. 21-1, in use since Oct. 1, 2008, was used again this year. It is well defined from 16 to 5500 cfs. Sixteen measurements (Nos. 266-281) were made this year, ranging in discharge from 73.7 to 2,110 cfs. They cover the discharge range experienced except for the lower daily flows on Oct. 25-29, 31, 2010, Mar. 31, Apr. 1-3, 5, 6, 2011. The peak flow of 2220 cfs occurred at 1000 on Jun. 7, 2011 at a gage height of 5.62 ft with a shift of +0.08 feet. It exceeded high measurement No. 275 (GH = 5.52), made Jun. 6, 2011, by 0.10 feet in stage.
Discharge.--	Shifting-control method was used for all open water periods. The stage-discharge relation was affected by ice and discharge estimated Nov. 14, 2010 - Jan. 1, 2011, Mar. 10-12, 2011. Two variable shift curves were used during the periods of Nov. 1, 2010 to Jul. 7, 2011 and Jul. 28 to Sep. 6, 2011. Shift curve VS11-1 was left open-ended at top since the peak was only 0.10 ft higher in stage than high measurement. During other periods, shifts were applied as defined by measurements and distributed by time and events. The measurement shifts ranged from -0.04 to +0.08 ft. All were given full weight except Nos. 266, 269, 270, 272, 274, and 277-280, which were adjusted as much as 4% to smooth shift distribution.
Special Computations.--	Discharge for periods of missing and unreliable gage-height and ice affected record was based on comparison with nearby gages using a river accounting sheet.
Remarks.--	Record is good except for periods of missing and unreliable gage-height and ice-affected record, which are estimated and poor. Record between M277 and M278 should be considered fair due to uncertainty of the timing of the control filling. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08221500 RIO GRANDE RIVER AT MONTE VISTA

RATING TABLE-- RIOMONCO21-1 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

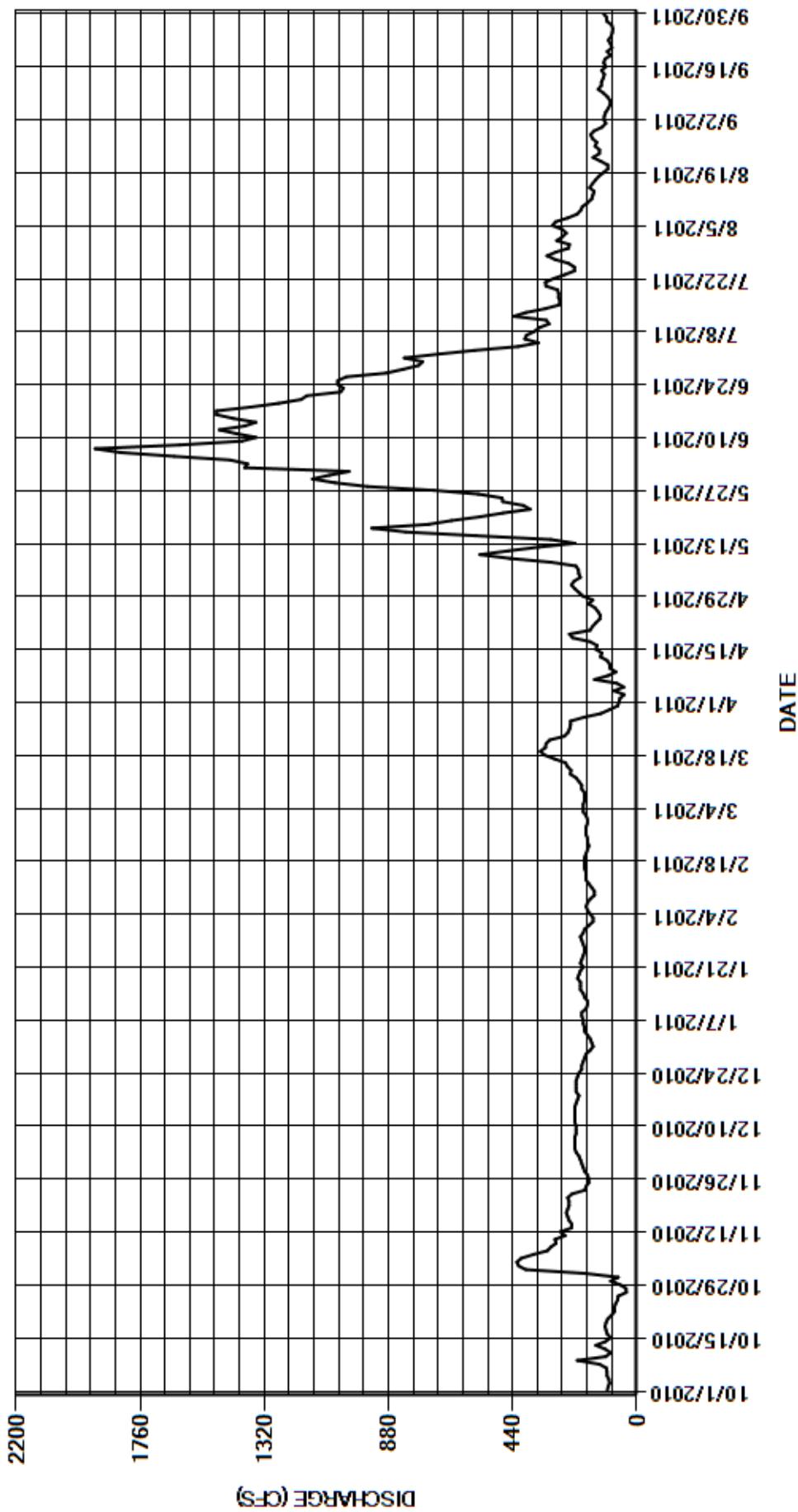
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	105	183	e200	e160	e170	e175	63	220	1020	824	284	110
2	102	393	e205	e165	e155	e180	60	232	1390	704	264	117
3	97	419	e215	e175	e155	e190	45	222	1380	575	250	115
4	99	425	e220	e185	e165	e190	81	200	1440	421	265	110
5	106	410	e220	e185	e175	e190	46	206	1640	349	299	101
6	106	367	e220	e190	e180	e185	71	207	1830	397	288	94
7	108	317	e220	e190	e175	e185	150	216	1920	391	245	95
8	133	304	e215	e195	e165	e185	102	304	1620	363	212	104
9	211	286	e215	e195	e150	e195	74	449	1400	346	199	118
10	111	290	e215	e180	e150	e195	96	556	1350	311	193	137
11	92	254	e220	e175	e160	e205	96	456	1420	321	175	126
12	112	271	e220	e175	e170	e215	105	348	1480	437	160	125
13	145	232	e220	e185	e180	236	129	219	1390	393	156	119
14	111	e230	e220	e190	e180	233	124	305	1350	325	151	115
15	93	e240	e220	e200	e180	246	145	570	1430	276	167	125
16	105	e245	e215	e200	e185	253	141	820	1490	272	158	110
17	109	e250	e210	e200	e185	291	166	939	1490	278	147	117
18	113	e245	e205	e210	e185	327	227	738	1370	277	135	113
19	109	e240	e215	e205	e185	342	239	657	1270	281	118	93
20	103	e240	e215	e200	e180	324	166	556	1190	322	102	105
21	89	e245	e215	e190	e175	322	157	475	1170	324	103	88
22	78	e230	e215	e200	e170	309	145	378	1050	294	128	93
23	80	e185	e210	e195	e175	257	131	402	1040	256	155	101
24	75	e180	e205	e190	e175	244	130	475	1060	221	133	91
25	68	e170	e195	e185	e180	238	138	478	1060	221	132	87
26	66	e170	e195	e185	e180	235	149	562	1030	242	148	85
27	37	e175	e190	e190	e180	235	171	719	888	289	142	89
28	38	e185	e185	e195	e175	188	156	954	828	318	157	106
29	59	e190	e180	e200	---	128	190	1070	774	286	164	107
30	93	e195	e165	e190	---	97	205	1150	759	242	152	118
31	66	---	e155	e185	---	68	---	1090	---	239	123	---
TOTAL	3019	7766	6415	5865	4840	6863	3898	16173	38529	10795	5505	3214
MEAN	97.4	259	207	189	173	221	130	522	1284	348	178	107
AC-FT	5990	15400	12720	11630	9600	13610	7730	32080	76420	21410	10920	6370
MAX	211	425	220	210	185	342	239	1150	1920	824	299	137
MIN	37	170	155	160	150	68	45	200	759	221	102	85
CAL YR	2010	TOTAL	108219	MEAN	296	MAX	1670	MIN	37	AC-FT	214700	
WTR YR	2011	TOTAL	112882	MEAN	309	MAX	1920	MIN	37	AC-FT	223900	

MAX DISCH: 2220 CFS AT 10:00 ON JUN 07,2011 GH 5.62 FT SHIFT 0.08 FT

MAX GH: 5.62 FT AT 10:00 ON JUN 07,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08221500 RIO GRANDE RIVER AT MONTE VISTA
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
RIO GRANDE RIVER AT RIO GRANDE-ALAMOSA COUNTY LINE
Water Year 2011

Location.--	Lat 37°34'23", long 106°3'27" referenced to North American Datum of 1983 (Homelake, CO quad, scale 1:24,000), UTM Zone 13 406619 E and 4158984 N, in NW ¼ NW ¼ sec. 1, T.38 N., R.8 E., New Mexico Principal Meridian, Rio Grande County, CO, Hydrologic Unit 13010002, on left bank 1 mi above bridge on county line road.
Drainage Area and Period of Record.--	1,640 mi ² . Apr. 1993 to current year.
Equipment.--	Graphic water stage recorder, data collection platform (Sutron Satlink2) and a float-operated shaft encoder in a 42-inch diameter corrugated metal well and shelter. The primary reference gage is a drop tape from reference point on shelf. Auxilliary outside staff gage installed Apr. 26, 2011.
Hydrologic Conditions.--	Watershed is comprised of valley floor and steep mountain headwaters. Headwaters areas are generally undeveloped with only sparse minimally populated areas. Valley floor is highly agriculturally based and flows from watershed are diverted for irrigation, livestock watering, domestic, commercial, recharge, and groundwater withdrawals. Flow at gage also includes return flows from all uses.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Feb. 2-17, 2011 when float was affected by ice in well. The stage-discharge relation was affected by ice Nov. 22, 2010 - Feb. 1, 2011, Feb. 18 - Mar. 8, 2011. There were two shaft encoder corrections, -0.01 ft on Jun. 8 and +0.01 ft on Aug. 16. Both were prorated by time from previous visit.
Datum Corrections.--	Levels were run to the Reference Point (RP) inside the gage on Jul. 28, 2011 using B.M. No. 4 as base. The RP elevation was within allowable limits, so a correction was not made. The outside staff gage was adjusted -0.07 ft. Two-peg tests were performed on the Lietz level (SN 130869) on May 27, Jul. 28, and Sep. 26, 2011. The instrument was adjusted slightly on Sep. 26, 2011.
Rating.--	Rating RIOLINCO09 was used again this year. Sixteen measurements (Nos. 353-368) were made this year ranging in discharge from 49.7 to 749 cfs. These measurements cover the discharge range experienced except for lower daily flows on Oct. 28, 2010, Apr. 2-6, 9-12, Sep. 6, 7, 27, 2011 and higher daily flows on Jun. 6, 7, 16, 17, 2011. The maximum discharge of 1090 cfs occurred at 1530 on Jun. 7, 2011 at a gage height of 5.32 ft. with a shift of +0.04 ft. It exceeded high measurement No. 361 (GH = 4.62) by 0.70 feet in stage.
Discharge.--	Shifting control method was used during all open water periods. The stage-discharge relation was affected by ice and discharge estimated Nov. 22, 2010 - Feb. 1, 2011, Feb. 18 - Mar. 8, 2011. Two variable shift curves were used to redefine the rating from Mar. 1 to Sep. 6, 2011. During other periods, shifts were applied as defined by measurements and distributed by time and events. Measurement shifts ranged from -0.02 to +0.13 ft. All were given full weight except for Nos. 353, 354, 358, 359, 361, 363, 365, and 368, which were adjusted by as much as 5% to smooth shift distribution. High measurement No. 361 was adjusted 3% from +0.13 to +0.08 in order to make shift curves hydrologically sound.
Special Computations.--	Discharge for periods of unreliable gage-height and ice affected record was estimated by comparison with nearby stations using a river accounting sheet.
Remarks.--	Record is good except for periods of unreliable gage-height and ice affected record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff .

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

RIO GRANDE RIVER AT RIO GRANDE-ALAMOSA COUNTY LINE

RATING TABLE-- RIOLINCO09 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

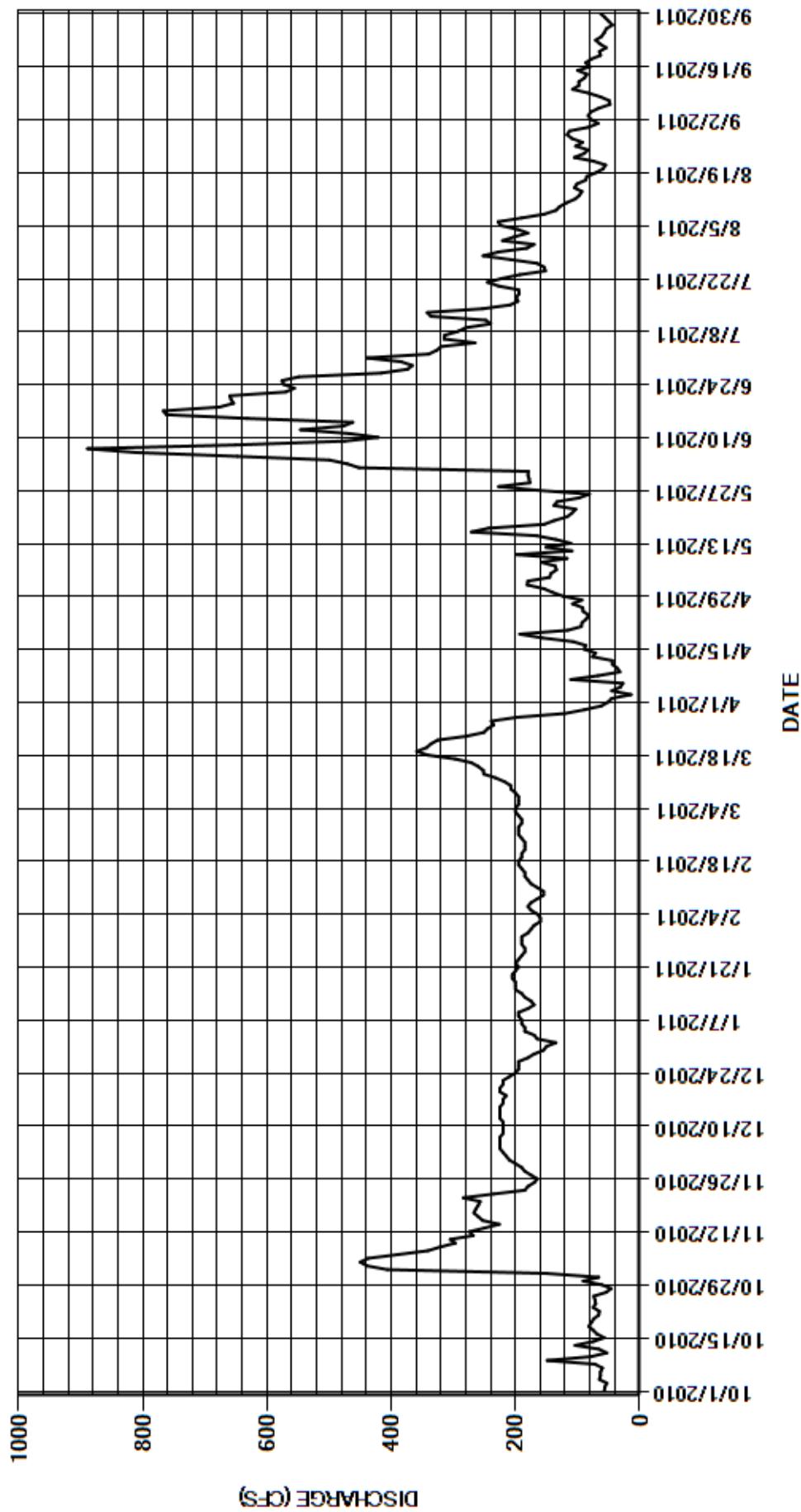
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	57	150	e210	e135	e170	e190	51	154	179	439	221	67
2	56	406	e215	e165	e160	e195	45	181	452	340	202	78
3	53	439	e220	e170	e160	e200	14	180	471	327	180	83
4	65	450	e225	e185	e165	e200	45	145	499	320	197	79
5	63	437	e225	e185	e175	e195	31	143	648	265	224	66
6	63	389	e225	e190	e180	e195	27	134	811	315	228	48
7	60	341	e225	e190	e175	e195	111	136	889	314	190	49
8	72	321	e220	e195	e165	e200	67	159	651	293	154	63
9	149	297	e220	e195	e155	207	32	117	475	280	135	82
10	79	305	e220	e180	e155	208	36	198	421	240	129	108
11	53	268	e220	e170	e165	218	44	109	467	248	118	98
12	66	274	e225	e175	e175	232	44	151	546	336	104	98
13	104	250	e225	e185	e180	251	76	111	477	342	97	89
14	75	226	e225	e190	e185	252	71	135	462	253	93	85
15	57	253	e225	e200	e185	260	89	166	632	209	105	100
16	69	260	e220	e200	e190	271	87	271	762	196	101	80
17	75	267	e220	e200	e195	297	107	243	767	199	87	87
18	82	264	e215	e205	e195	341	157	154	677	194	85	78
19	78	260	e225	e205	e190	359	193	138	654	195	70	63
20	74	257	e225	e200	e190	343	116	117	658	227	59	65
21	66	284	e220	e195	e185	336	94	109	660	245	55	54
22	65	e235	e220	e200	e185	325	93	103	570	222	74	64
23	75	e185	e210	e195	e185	279	86	138	556	193	105	71
24	71	e180	e200	e190	e190	251	82	133	573	152	90	61
25	72	e170	e195	e185	e195	245	91	98	576	154	83	57
26	74	e165	e195	e185	e195	235	92	81	549	165	103	54
27	54	e175	e195	e190	e195	239	108	164	416	208	92	44
28	46	e185	e180	e190	e190	198	93	227	374	252	109	50
29	61	e190	e170	e190	---	121	123	177	366	228	117	56
30	91	e200	e155	e180	---	89	140	178	384	182	113	63
31	66	---	e150	e175	---	62	---	180	---	170	82	---
TOTAL	2191	8083	6520	5795	5030	7189	2445	4730	16622	7703	3802	2140
MEAN	70.7	269	210	187	180	232	81.5	153	554	248	123	71.3
AC-FT	4350	16030	12930	11490	9980	14260	4850	9380	32970	15280	7540	4240
MAX	149	450	225	205	195	359	193	271	889	439	228	108
MIN	46	150	150	135	155	62	14	81	179	152	55	44
CAL YR	2010	TOTAL	63831	MEAN	175	MAX	676	MIN	15	AC-FT	126600	
WTR YR	2011	TOTAL	72250	MEAN	198	MAX	889	MIN	14	AC-FT	143300	

MAX DISCH: 1090 CFS AT 15:30 ON JUN 07,2011 GH 5.32 FT SHIFT 0.04 FT

MAX GH: 5.32 FT AT 15:30 ON JUN 07,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

RIO GRANDE RIVER AT RIO GRANDE-ALAMOSA COUNTY LINE
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08223000 RIO GRANDE RIVER AT ALAMOSA
Water Year 2011

Location.--	Lat 37°28'51", long 105°52'41" referenced to North American Datum of 1983 (Alamosa West, CO quad, scale 1:24,000), UTM Zone 13 422367 E and 4148575 N, in SE ¼ NE ¼ sec. 4, T.37 N., R.10 E., New Mexico Principal Meridian, Alamosa County, CO, Hydrologic Unit 13010002, on left bank 0.3 mi northwest of Adams State College and 9 mi upstream from Alamosa Creek.
Drainage Area and Period of Record.--	1,710 mi ² . Apr. 7, 1915 to current year.
Equipment.--	Graphic water-stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio), air temperature sensor, and a float-operated shaft encoder in a 4 ft. by 6 ft. exposed aggregate building with a 4 ft. diameter concrete well. Primary reference gage is a drop tape from reference point on shelf. Auxiliary outside staff gage installed May 25, 2011.
Hydrologic Conditions.--	Watershed is comprised of valley floor and steep mountain headwaters. Headwaters areas are generally undeveloped with only sparse minimally populated areas. Valley floor is highly agriculturally based and flows from watershed are diverted for irrigation, livestock watering, domestic, commercial, recharge, and groundwater withdrawals. Flow at gage also includes return flows from all uses. Riparian areas in the vicinity of the gage have been modified by flood protection levees through the city of Alamosa thus water stage is affected by levees and vegetative growth within levees.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Feb. 2-18, 2011 when floats were affected by ice in well. The stage-discharge relation was affected by ice Nov. 22, 2010 - Feb. 1, 2011, Feb. 19-24, 2011. There were two shaft encoder corrections, +0.01 ft on Oct. 20 and -0.01 ft on Nov. 3, 2010, which were prorated by time from previous visits. There was also a +0.08 ft shaft encoder correction on Feb. 25, 2011, which was distributed from Feb. 5, 2011 when float broke free from ice in well.
Datum Corrections.--	Levels were not shot this year. Levels were last shot on Jul. 13, 2010 using B.M. No. 7 as base. The RP elevation was within allowable limits, so a correction was not made.
Rating.--	The control is a sand streambed and channel. The sand movement, change in vegetation, and changes to downstream diversion structure (Westside Diversion) cause numerous shift changes. Rating No. 22D was used this water year. The upper end of curve (above 1500 cfs) was created by the USGS using step-backwater analysis method as part of a cooperative rating curve extension project. Seventeen measurements (Nos. 331-347) were made this year ranging in discharge from 40.5 to 561 cfs. They cover the discharge range experienced except for lower daily flows on Oct. 13, 2010, Apr. 10-15, Sep. 7, 8, 26-30, 2011. The peak flow of 609 cfs occurred at 0715 on Jun. 8, 2011 at a gage height of 4.77 ft with a shift of -0.58 ft. It exceeded high measurement No. 341 (GH=4.60), made Jun. 8, 2011, by 0.17 ft. in stage.
Discharge.--	Shifting control method was used for all open water periods. The stage-discharge relation was affected by ice and discharge estimated Nov. 22, 2010 - Feb. 1, 2011, Feb. 19-24, 2011. Although the control consists of sand streambed and channel, this year's shifts indicate two main shift trends. These trends were used to create three shift curves, which redefine the rating for different periods. The shift curves were used from Oct. 20, 2010 through Sep. 30, 2011. During other periods, shifts were applied as defined by measurements and distributed by time. Measurement shifts ranged from -0.63 to -0.31 ft. All measurements were given full weight except Nos. 333, 336-339, and 343, which were adjusted by as much as 5% to smooth shift distribution.
Special Computations.--	Discharge for periods of unreliable gage-height and ice-affected record was estimated by comparison with nearby stations using a river accounting sheet.
Remarks.--	Record is good, except for periods of unreliable gage-height and ice-affected record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08223000 RIO GRANDE RIVER AT ALAMOSA

RATING TABLE-- RIOALACO22D USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

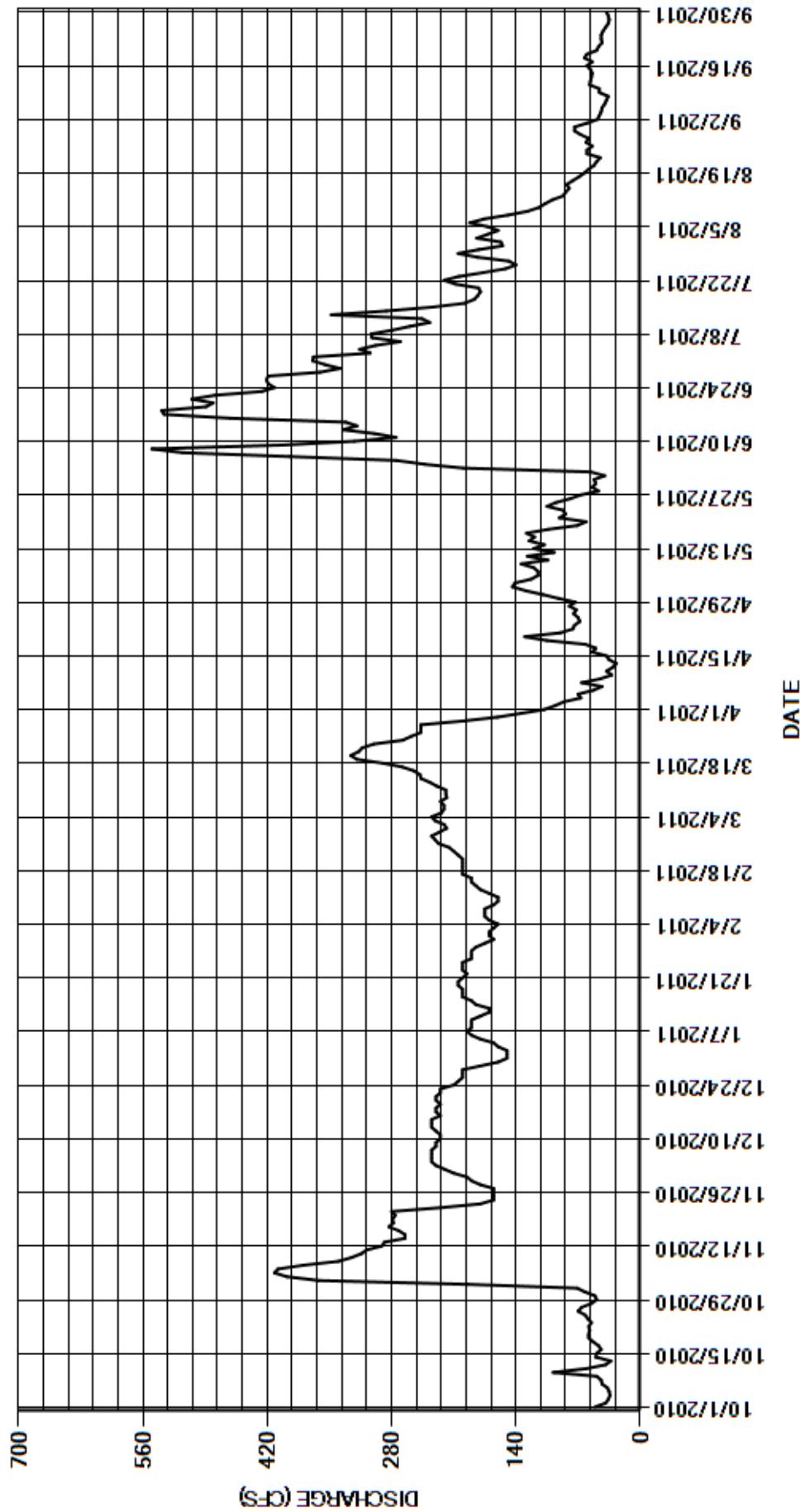
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	51	71	e210	e150	e170	218	108	110	40	369	157	60
2	39	194	e220	e150	e170	221	96	129	56	368	184	48
3	36	362	e230	e160	e165	231	86	144	199	304	172	46
4	34	398	e235	e165	e160	235	67	141	243	316	160	44
5	35	412	e235	e180	e170	224	70	123	275	298	172	43
6	37	408	e235	e190	e175	221	53	115	395	270	192	40
7	43	379	e235	e195	e175	221	43	115	515	302	176	38
8	44	340	e230	e190	e175	225	66	120	550	303	149	36
9	49	325	e230	e190	e165	218	45	134	403	279	127	46
10	98	314	e225	e190	e160	219	32	104	322	259	114	46
11	61	308	e225	e180	e160	219	38	127	275	237	107	57
12	39	291	e230	e170	e170	229	31	97	299	246	99	56
13	33	288	e235	e170	e180	237	27	120	335	348	87	55
14	50	265	e235	e185	e185	247	35	108	319	286	84	54
15	49	265	e235	e190	e190	248	38	125	332	234	80	56
16	44	272	e225	e200	e190	255	54	119	462	198	83	60
17	47	283	e230	e200	e200	268	50	128	536	187	76	54
18	53	278	e230	e200	e200	290	62	104	539	183	69	63
19	58	279	e225	e205	e200	319	105	71	489	180	63	60
20	58	276	e230	e205	e200	326	130	61	481	182	58	49
21	57	280	e230	e200	e200	317	90	91	505	208	52	47
22	58	e225	e225	e195	e205	313	76	84	479	221	49	43
23	55	e180	e225	e200	e210	300	74	87	426	204	45	44
24	59	e165	e210	e200	e215	267	68	105	412	177	60	44
25	62	e165	e205	e200	227	258	70	95	419	152	60	42
26	70	e165	e200	e190	231	247	75	79	421	140	54	39
27	66	e165	e200	e190	235	247	72	67	419	148	61	36
28	55	e180	e200	e190	226	247	80	47	361	183	58	35
29	49	e190	e180	e185	---	199	73	54	338	205	67	36
30	51	e195	e160	e175	---	161	92	50	355	182	74	38
31	62	---	e150	e165	---	134	---	52	---	155	74	---
TOTAL	1602	7918	6770	5755	5309	7561	2006	3106	11200	7324	3063	1415
MEAN	51.7	264	218	186	190	244	66.9	100	373	236	98.8	47.2
AC-FT	3180	15710	13430	11420	10530	15000	3980	6160	22220	14530	6080	2810
MAX	98	412	235	205	235	326	130	144	550	369	192	63
MIN	33	71	150	150	160	134	27	47	40	140	45	35
CAL YR	2010	TOTAL	54496	MEAN	149	MAX	667	MIN	20	AC-FT	108100	
WTR YR	2011	TOTAL	63029	MEAN	173	MAX	550	MIN	27	AC-FT	125000	

MAX DISCH: 609 CFS AT 07:15 ON JUN 08,2011 GH 4.77 FT SHIFT -0.58 FT

MAX GH: 4.77 FT AT 07:15 ON JUN 08,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08223000 RIO GRANDE RIVER AT ALAMOSA
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
372833105455800 CLOSED BASIN PROJECT CANAL NEAR ALAMOSA
Water Year 2011

Location.--	Lat 37°28'33", long 105°46'2" referenced to North American Datum of 1983 (Alamosa East, CO quad, scale 1:24,000), UTM Zone 13 432167 E and 4147927 N, in SW ¼ SW ¼ sec. 3, T.37 N., R.11 E., New Mexico Principal Meridian, Alamosa County, CO, Hydrologic Unit 13010002, on right bank 400 ft north of State Highway 160, 5.5 mi east of Alamosa, CO.
Drainage Area and Period of Record.--	Not applicable. Sept. 23, 1987 to current year.
Equipment.--	Graphic water stage recorder, data collection platform (Sutron Satlink) and two float-operated shaft encoders on wells Ha and Hb in 8 ft. x 10 ft. steel plated building with concrete stilling wells at a 12 ft concrete Parshall flume. The Bureau of Reclamation owns and operates an independent electronic data acquisition system using pressure transducers, a water quality monitor, and temperature sensor. The primary reference gage is a drop tape from reference point on shelf. There is a supplemental outside staff gage in the flume.
Hydrologic Conditions.--	Flow regulated by wells supplying water to canal and by the operation of San Luis Lake. Diversions above the gage to San Luis Lake and to the Blanca Wildlife Habitat Area.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable. There were two instrument corrections made to the shaft encoder ranging from -0.01 to +0.01 ft, which were prorated from the previous visit.
Datum Corrections.--	Levels were run September 1, 2011 to the Ha well and Hb well Reference Points (RP) inside the gage using B.M. No. 1 as base. Elevations of both RPs were within allowable limits, so no correction was made. Two-peg tests were performed on the instrument on May 27, Jul. 28, and Sep. 26, 2011. The instrument was adjusted slightly on Sep. 26, 2011.
Rating.--	The control structure is a 12 ft concrete Parshall flume. A standard rating for a 12 ft. Parshall flume has been in use since Sep. 23, 1987. Thirty-two measurements (Nos. 609-640) were made this year, ranging in discharge from 12.2 to 28.3 cfs. They cover the discharge range experienced except for the lower daily flows on Nov. 28, 2010, Jun. 24, 2011. The peak flow of 51.4 cfs occurred at 0330 on Nov. 24, 2010 at a gage height of 1.05 feet with a shift of +0.01 feet. It exceeded high measurement No. 616 (GH=0.69 ft.), made Dec. 16, 2010, by 0.36 feet in stage.
Discharge.--	Shifting control method was used for the entire year. Shifts were applied as defined by measurements and were distributed by time. There were numerous cleaning corrections, which were applied as shifts and prorated from the previous visit. Measurement shifts ranged from -0.05 to +0.04 feet. Due to the high frequency of measurements and stable control, measurements were adjusted as much as 8% to fit the shift trend. Measurement 620 was not used due to an assumed meter problem, but a check measurement was made the next day. The high measurement, No. 616, was adjusted by 7.2% because of high variability in transects using WM13. A check measurement, 617, using WM12 was given more weight and all were adjusted to +0.01 ft to fit the generalized shift trend.
Special Computations.--	The calculated discharge values on Nov. 1, 8, 11, 24, 2010 were adjusted by +/- 1 cfs in order for the 2011 Water Year values to match the final 2010 Calendar Year values. The small discrepancies are due to mathematical differences between the old system using hourly average values and the new system using 15 minute unit values for daily mean discharge calculation. All periods of potential backwater were checked and no submergence was found.
Remarks.--	Record is good. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

372833105455800 CLOSED BASIN PROJECT CANAL NEAR ALAMOSA

RATING TABLE-- CBPALACO01 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

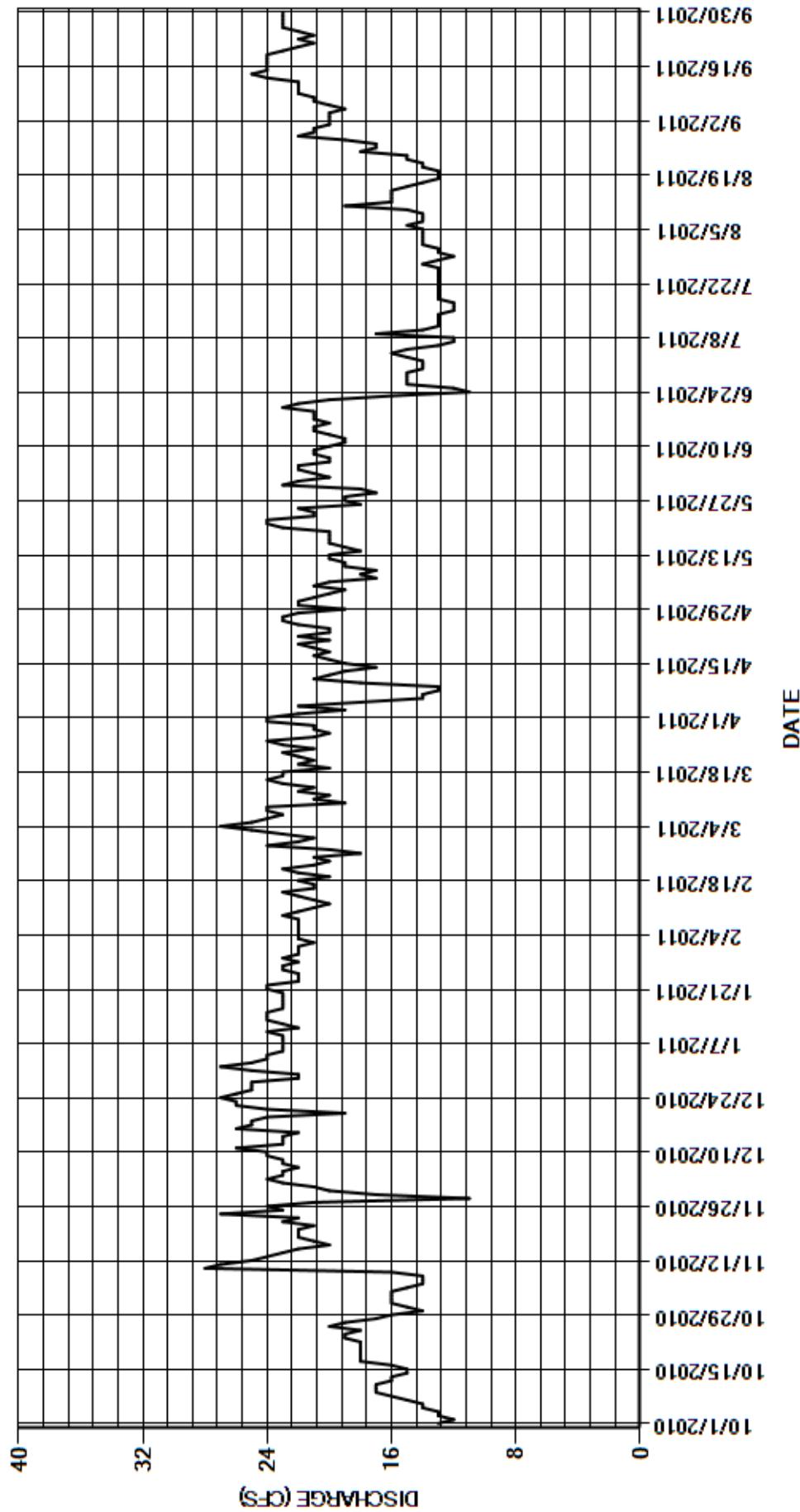
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	13	16	21	27	22	21	24	22	22	14	14	20
2	12	16	23	25	21	23	22	21	20	14	14	20
3	13	16	24	24	22	25	19	20	21	15	14	20
4	13	16	23	24	22	27	22	19	22	16	14	20
5	14	15	23	23	22	25	18	21	22	15	14	19
6	14	14	22	23	22	24	14	20	20	13	15	20
7	15	14	23	23	22	23	14	17	20	12	14	21
8	16	14	23	23	22	24	13	18	21	12	14	21
9	17	16	24	23	23	24	13	17	21	17	14	22
10	17	28	24	24	22	19	18	19	20	14	15	22
11	17	27	26	22	21	21	21	19	19	13	19	22
12	16	25	23	23	20	20	20	20	19	13	16	22
13	16	24	23	24	21	22	19	20	20	13	16	24
14	15	23	23	24	22	21	17	18	21	13	16	25
15	15	22	22	24	23	23	19	19	21	12	16	24
16	16	20	26	23	21	24	20	20	20	12	15	24
17	18	21	25	23	21	23	21	20	21	12	14	24
18	18	22	25	23	22	23	20	20	21	13	13	24
19	18	22	24	23	20	20	21	20	21	13	13	24
20	18	22	19	23	22	22	22	23	23	13	13	23
21	18	21	24	24	23	21	20	24	22	13	14	22
22	18	23	26	24	21	22	22	24	20	13	14	21
23	19	22	26	22	20	23	20	21	16	13	15	22
24	19	27	27	22	21	21	20	21	11	13	15	21
25	18	23	26	22	18	23	22	22	12	13	18	22
26	20	24	25	23	20	24	23	18	15	13	17	23
27	19	21	25	23	24	21	23	19	15	14	17	23
28	17	11	25	22	22	20	22	19	15	13	19	23
29	16	17	22	23	---	21	19	17	15	12	22	23
30	14	20	22	22	---	21	22	18	14	13	21	23
31	15	---	25	22	---	24	---	23	---	13	21	---
TOTAL	504	602	739	720	602	695	590	619	570	412	486	664
MEAN	16.3	20.1	23.8	23.2	21.5	22.4	19.7	20.0	19.0	13.3	15.7	22.1
AC-FT	1000	1190	1470	1430	1190	1380	1170	1230	1130	817	964	1320
MAX	20	28	27	27	24	27	24	24	23	17	22	25
MIN	12	11	19	22	18	19	13	17	11	12	13	19
CAL YR	2010	TOTAL	7899	MEAN	21.6	MAX	29	MIN	11	AC-FT	15670	
WTR YR	2011	TOTAL	7203	MEAN	19.7	MAX	28	MIN	11	AC-FT	14290	

MAX DISCH: 51.4 CFS AT 03:30 ON NOV 24,2010 GH 1.05 FT SHIFT 0.01 FT

MAX GH: 1.05 FT AT 03:30 ON NOV 24,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

372833105455800 CLOSED BASIN PROJECT CANAL NEAR ALAMOSA
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08224500 KERBER CREEK NEAR VILLA GROVE
Water Year 2011

Location.--	Lat 38°13'13", long 106°5'23" referenced to North American Datum of 1983 (Graveyard Gulch, CO quad, scale 1:24,000), UTM Zone 13 404622 E and 4230810 N, in SW ¼ SE ¼ sec. 21, T.46 N., R.8 E., New Mexico Principal Meridian, Saguache County, CO, Hydrologic Unit 13010003, on left bank 7 mi west of Villa Grove, CO and 5 ½ mi downstream from Bonanza, CO.
Drainage Area and Period of Record.--	45.4 mi ² (revised). (approx.) June 1, 1923- September 16, 1926, May 2, 1936-September 30, 1982, October 1, 1993-current year.
Equipment.--	Graphic water-stage recorder, data collection platform (Sutron Satlink), and a float-operated shaft encoder in a 6 ft by 6 ft exposed aggregate shelter and 48 inch concrete well. On Nov. 10, 2009 the gage was equipped with a tipping bucket rain gage. The primary reference gage is a drop tape from reference point on shelf. An outside gage was installed Aug. 4, 2011.
Hydrologic Conditions.--	Station is located in a narrow high mountain valley with slender meadows and numerous homes scattered along the hill sides.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Jan. 1-5, and Mar. 4-16, 2011 when ice in the well was affecting the floats; Jan. 6 through Mar. 3, 2011 when the station was closed; and Jun. 1, 2 when the inlets were closed. The stage-discharge relation was affected by ice Nov. 22-30, Dec. 1-31, 2010, Mar. 17-29, Apr. 2-4, 2011. There were no instrument corrections made to the shaft encoder. Two flush corrections were applied due to false rise in stage values resulting from valves being closed for flushing.
Datum Corrections.--	Levels were ran to the Reference Point (RP) inside the gage on Aug. 30, 2011 using B.M. No. 8 as base. The RP elevation was within the allowable limit, therefore, no correction was made. Two-peg tests were performed on the instrument on May 27, Jul. 28, and Sep. 26, 2011. The instrument was adjusted slightly on Sep. 26, 2011.
Rating.--	Control is a concrete ramp flume approximately 10 feet downstream from gage. Shifting occurs mainly due to the movement of streambed materials in the gage pool. At high stages the stilling well experiences drawdown as observed when the upper inlets are closed the gage height rises. Rating No. 19 was used all year. Sixteen measurements (Nos. 135 -150) were made this year ranging in discharge from 1.37 to 38.9 cfs. The measurements cover the discharge range experienced except for higher daily flows on Jun. 5-8, 2011, and the lower flows on Dec. 18, 30, 31, 2010, Jan. 1-4, 11, 25, Feb. 2, 9, 10, and Mar. 7-9, 2011. The peak flow of 46.1 cfs occurred at 0115 on Jun. 7, 2011 at a gage height of 1.06 feet with a shift of 0.08 feet. It exceeded high measurement No. 145 made at a GH of 1.00 ft. made June 8, 2011 by 0.06 feet in stage.
Discharge.--	Shifting control method was used for all open water periods. The stage-discharge relation was affected by ice and discharge was estimated Nov. 22-30, Dec. 1-31, 2010, Mar. 17-29, Apr. 2-4, 2011. Two shift curves were used to apply shifts from Oct. 1 into ice, and from May 18 to Aug. 4, 2011. During other open water periods, shifts were applied as defined by measurements and distributed by time. Measurement shifts ranged from 0 and +0.08 ft. All measurements were given full weight except Nos. 135, 141, 142, 146, and 149, which were adjusted as much as 6% to smooth shift distribution.
Special Computations.--	Discharge for periods of no gage-height and ice affected record was estimated using measurements, partial day records, trends, nearby stations, and weather records.
Remarks.--	The record is good except for periods of no gage-height and ice affected record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	A new rating may improve record quality. Look at developing stage-drawdown curve to improve record.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08224500 KERBER CREEK NEAR VILLA GROVE

RATING TABLE-- KERVILCO19 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

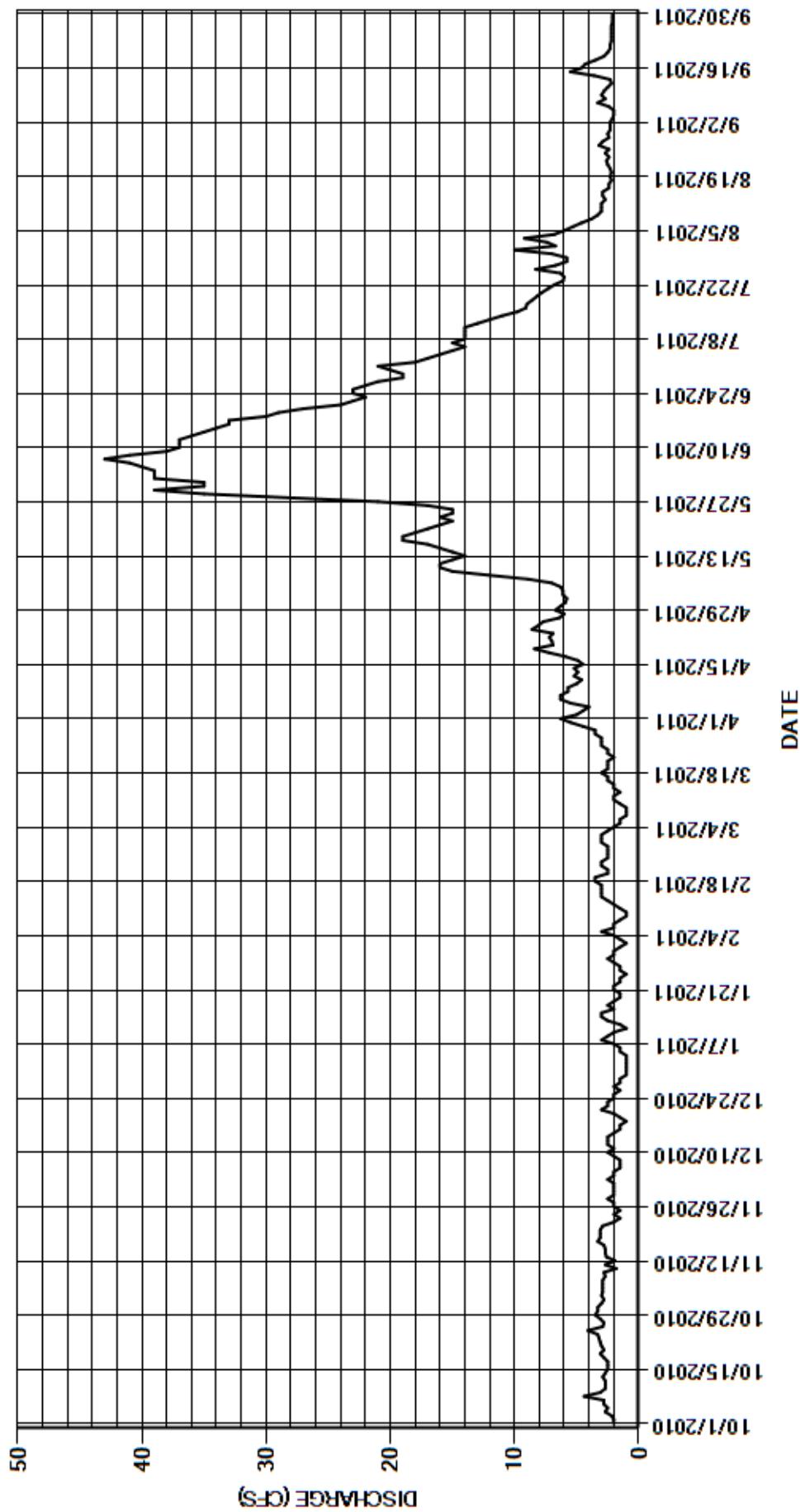
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.0	3.0	e2.0	e1.0	e1.5	e3.0	6.3	5.9	e35	21	6.7	2.3
2	2.0	2.8	e2.0	e1.0	e1.0	e3.0	e5.0	5.8	e39	18	7.4	2.3
3	2.2	3.0	e2.5	e1.0	e1.5	e2.5	e4.5	6.1	39	17	9.2	2.1
4	2.7	2.9	e2.0	e1.0	e2.0	e2.0	e4.0	6.1	39	16	6.8	2.0
5	2.5	2.9	e2.0	e1.5	e3.0	e1.5	5.5	6.3	40	15	6.0	2.0
6	2.8	2.9	e1.5	e1.5	e2.0	e1.5	6.3	7.0	41	14	5.3	2.4
7	2.8	2.9	e1.5	e2.0	e2.0	e1.0	6.3	8.9	43	15	4.6	3.3
8	4.4	2.7	e1.5	e3.0	e1.5	e1.0	5.7	12	41	14	3.8	2.7
9	3.1	2.8	e2.0	e2.5	e1.0	e1.0	5.7	15	38	14	3.3	3.0
10	2.7	1.8	e2.5	e2.0	e1.0	e1.5	5.0	16	37	14	3.0	2.8
11	2.7	2.7	e2.0	e1.0	e1.5	e2.0	4.6	16	37	14	3.0	2.5
12	2.7	1.9	e2.5	e1.5	e2.0	e2.0	5.2	15	37	13	3.0	2.2
13	2.9	2.6	e2.5	e2.5	e2.5	e1.5	4.9	14	36	12	2.7	2.3
14	2.7	2.7	e2.5	e3.0	e3.0	e2.0	5.2	15	35	11	2.9	3.6
15	2.5	2.7	e2.0	e3.0	e3.0	e2.0	4.5	16	34	9.8	2.9	5.5
16	2.5	2.8	e1.5	e2.0	e3.0	e2.5	4.9	17	33	9.1	2.4	4.6
17	2.5	3.3	e1.5	e2.5	e3.0	e2.5	5.9	19	33	9.0	2.4	4.3
18	2.8	3.1	e1.0	e2.0	e3.5	e3.0	7.2	19	30	8.6	2.2	3.5
19	3.1	3.1	e1.5	e1.5	e3.5	e2.5	8.4	18	29	8.2	2.3	2.8
20	2.8	3.1	e2.0	e1.5	e2.5	e2.5	6.9	17	27	7.8	2.2	2.5
21	3.0	2.9	e3.0	e2.0	e2.5	e2.5	7.0	16	24	7.3	2.3	2.3
22	3.1	e2.0	e2.5	e2.0	e3.0	e2.0	7.2	15	23	6.8	2.5	2.3
23	3.2	e1.5	e2.5	e1.5	e3.0	e2.5	6.9	16	22	6.1	2.6	2.2
24	3.3	e2.0	e2.0	e1.5	e2.5	e2.5	8.6	15	23	6.0	2.4	2.2
25	4.1	e1.5	e2.0	e1.0	e2.5	e3.0	8.1	15	23	6.3	2.7	2.2
26	2.9	e2.0	e1.5	e1.5	e2.5	e3.0	7.7	17	22	8.3	2.4	2.2
27	2.8	e2.0	e2.0	e1.5	e2.5	e3.0	6.4	21	21	6.7	3.2	2.2
28	3.1	e2.5	e1.5	e2.0	e3.0	e3.5	6.0	28	19	5.8	2.9	2.1
29	3.5	e2.0	e1.5	e2.5	---	e3.5	6.7	35	19	5.8	2.4	2.1
30	3.3	e2.0	e1.0	e2.0	---	4.5	6.3	39	20	7.0	2.5	2.1
31	3.3	---	e1.0	e2.0	---	5.5	---	35	---	10	2.3	---
TOTAL	90.0	76.1	59.0	56.5	65.5	76.0	182.9	507.1	939	336.6	110.3	80.6
MEAN	2.90	2.54	1.90	1.82	2.34	2.45	6.10	16.4	31.3	10.9	3.56	2.69
AC-FT	179	151	117	112	130	151	363	1010	1860	668	219	160
MAX	4.4	3.3	3.0	3.0	3.5	5.5	8.6	39	43	21	9.2	5.5
MIN	2.0	1.5	1.0	1.0	1.0	1.0	4.0	5.8	19	5.8	2.2	2.0
CAL YR	2010	TOTAL	3214.5	MEAN	8.81	MAX	62	MIN	1.0	AC-FT	6380	
WTR YR	2011	TOTAL	2579.6	MEAN	7.07	MAX	43	MIN	1.0	AC-FT	5120	

MAX DISCH: 46.1 CFS AT 01:15 ON JUN 07,2011 GH 1.06 FT SHIFT 0.08 FT

MAX GH: 1.59 FT AT 07:30 ON JAN 02,2011 (BACKWATER FROM ICE)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08224500 KERBER CREEK NEAR VILLA GROVE
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
GARNER CREEK NEAR VILLA GROVE

Water Year 2011

Location.--	Lat 38°10'23", long 105°48'35" referenced to North American Datum of 1983 (Valley View Hot Springs, CO quad, scale 1:24,000), UTM Zone 13 429079 E and 4225326 N, in SE ¼ SE ¼ sec. 1, T.45 N., R.10 E., New Mexico Principal Meridian, Saguache County, CO, Hydrologic Unit 13010003, on right bank 12 mi southeast of Villa Grove, CO.
Drainage Area and Period of Record.--	6.4 mi ² . Station was established at existing Parshall flume January 1, 1999 with the installation of stilling well and water-stage recorder. Stage data collection began March 21, 1999.
Equipment.--	Data collection platform (Sutron Satlink II) and a float-operated SDR shaft encoder in a 2 foot steel culvert pipe stilling well with a small steel box-type shelter atop well at a 2 foot Parshall Flume. Primary reference gage is outside staff on flume. The staff gage was moved to REW on Aug. 11, 2011. On Sep. 14, an RP and drop tape were added as the primary reference gage.
Hydrologic Conditions.--	Undeveloped steep alpine and subalpine terrain. There are a few diversions above gage.
Gage-Height Record.--	Primary record is 15-minute DCP transmitted stage data with DCP log and SDR log as backup. Record is complete and reliable except for Nov. 25-28, when well was frozen and Nov. 29, 2010 through Mar. 24, 2011 when the station was closed for the winter. The stage-discharge relation was affected by ice Nov. 13, 14, 22-28, 2010, Mar. 25, Apr. 4, 11, 2011. One erroneous unit value was corrected on Jun. 22 and one missing unit value was corrected on Jul. 26. There were 2.5 hours on Aug. 10 and 1 hour on Aug. 11 of erroneous unit values that were estimated. One instrument calibration correction of +0.01 ft was prorated by time from previous site visit.
Datum Corrections.--	The staff gage was moved from LEW to REW on Aug. 11, 2011, which resulted in a -0.20 ft change in datum. Therefore a +0.20 ft GH correction was applied from Mar. 24, when station was opened, to Aug. 11, 2011 to correct gage heights to new datum. A levels circuit was shot on Aug. 11, 2011, but not used. Three benchmarks and an inside reference point were established September 14, 2011. BM 1 is a lag bolt in rock located 27.4 feet NNE of gage, elevation 2.996 ft. BM 2 is a lag bolt in rock located 38 feet north of gage, elevation 3.664 ft. BM3 is a lag bolt in rock located 43.2 ft NNE of gage, elevation 4.815 feet. R.P is elevation 5.220 feet and tape length is 5.22 feet. A formal inspection of flume with levels was not performed.
Rating.--	The flume and well ice up during winter, and sediment movement in and above control causes minor shifting. Rating No. 1, a standard two foot Parshall flume rating, was used all year. The measurement shifts indicate consistent +0.08 to +0.10 ft shifts prior to the staff gage being moved from the left edge of water to the right edge fo water and -0.08 to -0.12 ft shifts after. These shifts are due to the sloping flume floor and sediment movement in and above the control. Sixteen discharge measurements (Nos. 173-188) were made this year, ranging in discharge from 0.91 to 1.73 cfs. The range in daily mean streamflow experienced this year was 0.9 to 1.7 cfs. Measurements cover the range experienced. The instantaneous peak flow of 2.09 cfs occurred at 1830 on Sep. 14, 2011 at a gage height of 0.54 ft with a shift of -0.12 ft. The peak gage height exceeded high flow measurement 179 with a gage height of 0.45 ft by 0.09 ft.
Discharge.--	Shifting control method was used during all periods of good record. The stage-discharge relation was affected by ice and discharge was estimated Nov. 13, 14, 22-28, 2010, Mar. 25, Apr. 4, 11, 2011. Shifts were applied as defined by discharge measurements and distributed by time. All measurements were given full weight except measurements 173, 180, 182, and 183 which were adjusted as much as 7.26 percent to smooth shifting.
Special Computations.--	Winter streamflow record was estimated using discharge measurements, comparison with Major Creek near Villa Grove, CO, and air temperature record from SANDUNCO.
Remarks.--	Record is fair except estimated daily discharge values, which are estimated and poor. Station maintained and record developed by Division 3 hydrographic staff.
Recommendations.--	Record quality may be improved by leveling Parshall flume. If flume is not leveled, but is stable, a new nonstandard rating may improve quality.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

GARNER CREEK NEAR VILLA GROVE

RATING TABLE-- GARVILCO01 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

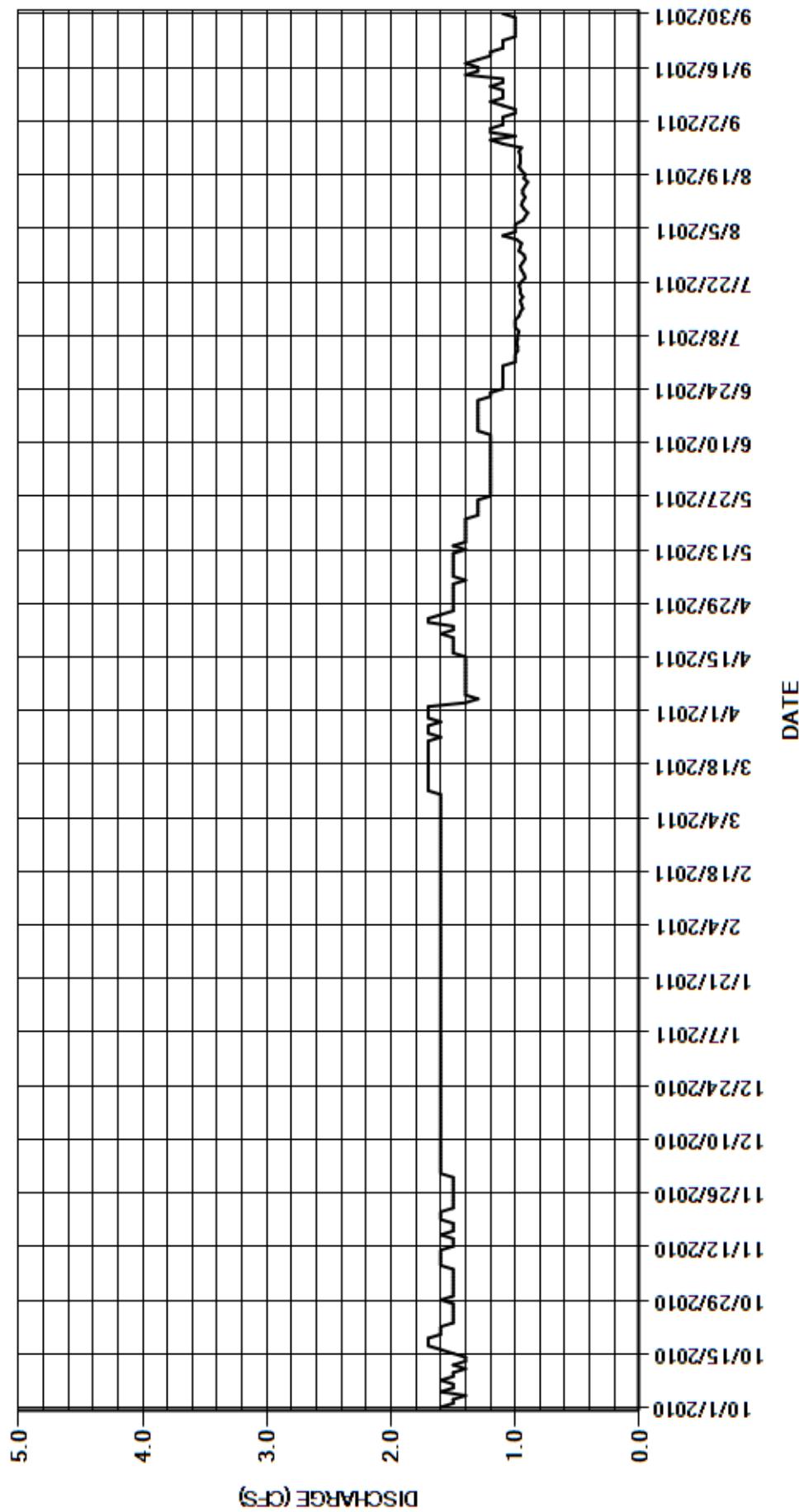
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.6	1.5	e1.6	e1.6	e1.6	e1.6	1.7	1.5	1.2	1.0	0.95	1.1
2	1.5	1.5	e1.6	e1.6	e1.6	e1.6	1.7	1.5	1.2	1.0	0.99	1.1
3	1.5	1.5	e1.6	e1.6	e1.6	e1.6	1.4	1.5	1.2	1.0	1.1	1.1
4	1.4	1.5	e1.6	e1.6	e1.6	e1.6	e1.3	1.5	1.2	0.98	1.0	1.0
5	1.6	1.5	e1.6	e1.6	e1.6	e1.6	1.4	1.4	1.2	0.98	1.0	1.0
6	1.5	1.5	e1.6	e1.6	e1.6	e1.6	1.4	1.5	1.2	0.99	1.0	1.1
7	1.5	1.6	e1.6	e1.6	e1.6	e1.6	1.4	1.5	1.2	0.98	0.94	1.2
8	1.6	1.6	e1.6	e1.6	e1.6	e1.6	1.4	1.5	1.2	0.98	0.92	1.1
9	1.5	1.6	e1.6	e1.6	e1.6	e1.6	1.4	1.5	1.2	0.97	0.90	1.1
10	1.5	1.6	e1.6	e1.6	e1.6	e1.6	1.4	1.5	1.2	1.0	0.93	1.1
11	1.4	1.6	e1.6	e1.6	e1.6	e1.7	e1.4	1.5	1.2	1.0	0.95	1.2
12	1.5	1.5	e1.6	e1.6	e1.6	e1.7	1.4	1.5	1.2	1.0	0.94	1.1
13	1.4	e1.5	e1.6	e1.6	e1.6	e1.7	1.4	1.4	1.3	0.97	0.92	1.1
14	1.4	e1.5	e1.6	e1.6	e1.6	e1.7	1.4	1.5	1.3	0.96	0.94	1.4
15	1.5	1.6	e1.6	e1.6	e1.6	e1.7	1.4	1.4	1.3	0.94	0.94	1.3
16	1.6	1.5	e1.6	e1.6	e1.6	e1.7	1.5	1.4	1.3	0.95	0.92	1.3
17	1.7	e1.5	e1.6	e1.6	e1.6	e1.7	1.5	1.4	1.3	0.96	0.90	1.4
18	1.7	1.5	e1.6	e1.6	e1.6	e1.7	1.5	1.4	1.3	0.94	0.93	1.3
19	1.7	1.6	e1.6	e1.6	e1.6	e1.7	1.5	1.4	1.3	0.96	0.92	1.2
20	1.6	1.6	e1.6	e1.6	e1.6	e1.7	1.5	1.4	1.3	0.96	0.95	1.2
21	1.6	1.6	e1.6	e1.6	e1.6	e1.7	1.6	1.4	1.3	0.97	0.97	1.1
22	1.6	e1.5	e1.6	e1.6	e1.6	e1.7	1.5	1.3	1.2	0.95	0.96	1.1
23	1.5	e1.5	e1.6	e1.6	e1.6	e1.7	1.5	1.3	1.2	0.92	0.96	1.1
24	1.5	e1.5	e1.6	e1.6	e1.6	e1.7	1.7	1.3	1.1	0.93	0.96	1.0
25	1.5	e1.5	e1.6	e1.6	e1.6	e1.6	1.7	1.3	1.1	0.95	0.97	1.0
26	1.5	e1.5	e1.6	e1.6	e1.6	1.7	1.6	1.3	1.1	0.96	0.95	1.0
27	1.5	e1.5	e1.6	e1.6	e1.6	1.7	1.5	1.2	1.1	0.94	1.1	1.0
28	1.5	e1.5	e1.6	e1.6	e1.6	1.7	1.5	1.2	1.1	0.92	1.2	1.0
29	1.6	e1.5	e1.6	e1.6	---	1.6	1.5	1.2	1.1	0.93	1.0	1.0
30	1.5	e1.5	e1.6	e1.6	---	1.7	1.5	1.2	1.1	0.97	1.2	1.1
31	1.5	---	e1.6	e1.6	---	1.7	---	1.2	---	0.96	1.2	---
TOTAL	47.5	45.9	49.6	49.6	44.8	51.5	44.6	43.1	36.2	29.92	30.51	33.8
MEAN	1.53	1.53	1.60	1.60	1.60	1.66	1.49	1.39	1.21	0.97	0.98	1.13
AC-FT	94	91	98	98	89	102	88	85	72	59	61	67
MAX	1.7	1.6	1.6	1.6	1.6	1.7	1.7	1.5	1.3	1.0	1.2	1.4
MIN	1.4	1.5	1.6	1.6	1.6	1.6	1.3	1.2	1.1	0.92	0.90	1.0
CAL YR	2010	TOTAL	713.80	MEAN	1.96	MAX	4.4	MIN	1.3	AC-FT	1420	
WTR YR	2011	TOTAL	507.03	MEAN	1.39	MAX	1.7	MIN	0.90	AC-FT	1010	

MAX DISCH: 2.09 CFS AT 18:30 ON SEP 14,2011 GH 0.54 FT SHIFT -0.12 FT

MAX GH: 0.54 FT AT 18:30 ON SEP 14,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

GARNER CREEK NEAR VILLA GROVE
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
MAJOR CREEK NEAR VILLA GROVE
Water Year 2011

Location.--	Lat 38°9'27", long 105°48'33" referenced to North American Datum of 1983 (Valley View Hot Springs, CO quad, scale 1:24,000), UTM Zone 13 429113 E and 4223602 N, in SE ¼ SE ¼ sec. 12, T.45 N., R.10 E., New Mexico Principal Meridian, Saguache County, CO, Hydrologic Unit 13010003, on right bank 11 mi southeast of Villa Grove, CO.
Drainage Area and Period of Record.--	5.0 mi ² . Station was established at existing parshall flume January 1, 1999 with the installation of stilling well and water-stage recorder. Stage data collection began March 21, 1999.
Equipment.--	Satellite monitored digital water-stage recorder, Sutron Satlink2 and Sutron SDR shaft encoder, in a 2-foot steel corrugated metal pipe stilling well with steel shelter atop well attached to the right edge of 2-foot Parshall flume via 1-inch intake pipe. No change during year.
Hydrologic Conditions.--	Predominantly undeveloped steep alpine and sub-alpine terrain.
Gage-Height Record.--	Primary record is 15-minute satellite transmitted stage data with electronic DCP and SDR logs as backup. Record is complete and reliable except for Nov. 25-28, 2010 when the well was frozen and Nov. 29, 2010 through Mar. 24, 2011 when station was closed for winter. Stage-discharge relation was affected by ice Oct. 28, Nov. 10-19, 22-24, 2010, and Mar. 25,26, Apr. 4, 11, 15, May 2, 2011. Instrument calibration corrections were applied when observed and prorated back to the previous visit.
Datum Corrections.--	A formal inspection with levels was not performed this year. The last formal inspection and levels were completed on July 24, 2008, with an assumed elevation of 0.000 at the flume staff gage (LEW) which is opposite the stilling well inlet (REW). Levels indicate that the flume floor slopes down from the LEW at the staff to the inlet by approximately 0.062 ft (Approx. 2%). The floor also slopes to the throat by 0.038 ft. Inspection included measurement of all pertinent Parshall Flume dimensions.
Rating.--	MAJVILCO01, standard two-foot Parshall flume rating, first used January 1, 1999, when the station was established, was used all year. During the current period, 15 discharge measurements were made ranging in discharge between 0.56 and 1.30 cfs. 12 open-water discharge measurements were made ranging in discharge between 0.61 and 1.16 cfs. Discharge measurements cover the range in streamflow experienced, except for lower daily flows February 10, 11, 20, 21, March 29, April 4-6, 8-11, 15, . The peak discharge of 2.32 cfs occurred at 2030 August 27, 2011 at a gage height of 0.44 ft with a shift of +0.01 ft. The peak exceeded the stage of maximum measured discharge by 0.17 ft.
Discharge.--	Shifts for the open water record result from sand and gravel movement and vegetation growth upstream and within the flume. Stage-discharge relation was affected by ice and discharge estimated Oct. 28, Nov. 10-19, 22-24, 2010, and Mar. 25, 26, April 4, 11, 15, May 2, 2011. Applied shifts range from -0.01 ft to 0.01 ft. Three measurements were adjusted, Nos. 174, 183, and 188, to smooth shift distribution. Two cleaning corrections were noted and prorated back to the previous visit.
Special Computations.--	Discharge for periods of no gage-height and ice affected record was estimated using discharge measurements and weather records.
Remarks.--	Record is good, except for periods of no gage-height and ice affected record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	Establish inside reference point and drop tape.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

MAJOR CREEK NEAR VILLA GROVE

RATING TABLE-- MAJVILCO01 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

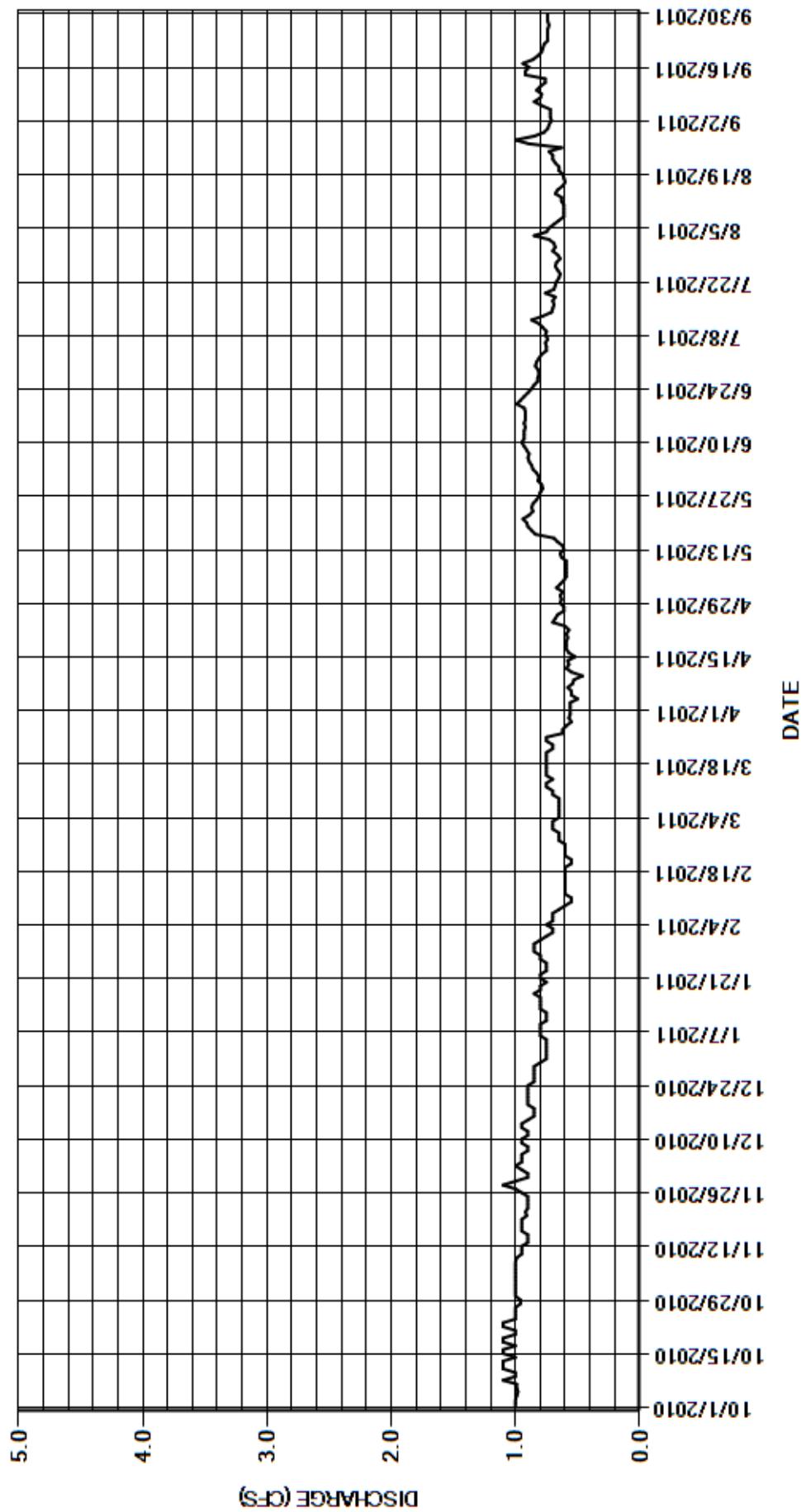
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.0	1.0	e0.90	e0.75	e0.75	e0.70	0.56	0.64	0.81	0.83	0.69	0.73
2	1.0	1.0	e0.95	e0.75	e0.70	e0.70	0.56	e0.62	0.83	0.81	0.73	0.71
3	1.0	1.0	e1.0	e0.75	e0.70	e0.70	0.56	0.67	0.86	0.79	0.85	0.72
4	0.99	1.0	e0.95	e0.75	e0.75	e0.65	e0.50	0.64	0.87	0.75	0.75	0.72
5	0.98	1.0	e0.95	e0.75	e0.70	e0.65	0.55	0.61	0.89	0.75	0.73	0.72
6	0.99	1.0	e0.95	e0.80	e0.70	e0.65	0.55	0.59	0.90	0.76	0.69	0.79
7	0.99	1.0	e0.90	e0.80	e0.70	e0.65	0.58	0.59	0.89	0.74	0.65	0.85
8	1.1	1.0	e0.90	e0.80	e0.65	e0.65	0.54	0.59	0.91	0.76	0.61	0.80
9	1.0	0.99	e0.95	e0.80	e0.60	e0.65	0.53	0.59	0.93	0.75	0.61	0.79
10	1.0	e0.95	e0.95	e0.75	e0.55	e0.70	0.46	0.59	0.95	0.78	0.61	0.83
11	1.1	e0.95	e0.90	e0.75	e0.55	e0.70	e0.55	0.63	0.93	0.81	0.61	0.80
12	1.1	e0.95	e0.90	e0.75	e0.60	e0.75	0.59	0.64	0.93	0.87	0.63	0.76
13	1.1	e0.90	e0.95	e0.80	e0.60	e0.75	0.57	0.61	0.93	0.78	0.63	0.76
14	1.0	e0.90	e0.95	e0.80	e0.60	e0.70	0.58	0.62	0.92	0.71	0.68	0.92
15	1.1	e0.90	e0.90	e0.80	e0.60	e0.75	e0.52	0.66	0.93	0.70	0.66	0.92
16	1.1	e0.95	e0.85	e0.80	e0.60	e0.75	0.57	0.69	0.92	0.69	0.62	0.89
17	1.0	e0.95	e0.85	e0.85	e0.60	e0.75	0.59	0.84	0.92	0.70	0.60	0.94
18	1.1	e0.95	e0.85	e0.80	e0.60	e0.75	0.59	0.87	0.92	0.68	0.61	0.86
19	1.1	e0.95	e0.90	e0.80	e0.60	e0.75	0.59	0.90	0.93	0.76	0.62	0.82
20	1.0	0.91	e0.90	e0.75	e0.55	e0.75	0.58	0.91	0.99	0.69	0.65	0.79
21	1.0	0.92	e0.90	e0.80	e0.55	e0.75	0.59	0.94	0.96	0.68	0.65	0.78
22	1.1	e0.90	e0.90	e0.80	e0.60	e0.70	0.57	0.89	0.93	0.67	0.68	0.77
23	1.1	e0.90	e0.90	e0.75	e0.60	e0.70	0.60	0.86	0.90	0.65	0.70	0.74
24	1.0	e0.90	e0.90	e0.75	e0.60	e0.75	0.70	0.87	0.87	0.64	0.70	0.74
25	1.0	e0.90	e0.85	e0.75	e0.60	e0.75	0.68	0.86	0.85	0.66	0.73	0.74
26	1.0	e0.95	e0.85	e0.80	e0.65	e0.62	0.66	0.83	0.82	0.68	0.63	0.74
27	1.0	e1.0	e0.85	e0.80	e0.65	0.62	0.61	0.81	0.82	0.67	0.89	0.73
28	e0.96	e1.1	e0.85	e0.85	e0.65	0.59	0.61	0.80	0.81	0.64	1.0	0.74
29	0.96	e1.0	e0.85	e0.85	---	0.55	0.64	0.78	0.82	0.66	0.85	0.74
30	1.0	e0.90	e0.80	e0.85	---	0.57	0.63	0.79	0.84	0.70	0.77	0.74
31	1.0	---	e0.75	e0.80	---	0.56	---	0.82	---	0.68	0.74	---
TOTAL	31.87	28.72	27.75	24.40	17.60	21.26	17.41	22.75	26.78	22.44	21.57	23.58
MEAN	1.03	0.96	0.90	0.79	0.63	0.69	0.58	0.73	0.89	0.72	0.70	0.79
AC-FT	63	57	55	48	35	42	35	45	53	45	43	47
MAX	1.1	1.1	1.0	0.85	0.75	0.75	0.70	0.94	0.99	0.87	1.0	0.94
MIN	0.96	0.90	0.75	0.75	0.55	0.55	0.46	0.59	0.81	0.64	0.60	0.71
CAL YR	2010	TOTAL	435.77	MEAN	1.19	MAX	2.9	MIN	0.75	AC-FT	864	
WTR YR	2011	TOTAL	286.13	MEAN	0.78	MAX	1.1	MIN	0.46	AC-FT	568	

MAX DISCH: 2.32 CFS AT 20:30 ON AUG 27,2011 GH 0.44 FT SHIFT 0.01 FT (Rainfall event)

MAX GH: 0.44 FT AT 20:30 ON AUG 27,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

MAJOR CREEK NEAR VILLA GROVE
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08226700 COTTON CREEK NEAR MINERAL HOT SPRINGS
Water Year 2011

Location.--	Lat 38°7'55", long 105°47'19" referenced to North American Datum of 1983 (Valley View Hot Springs, CO quad, scale 1:24,000), UTM Zone 13 430885 E and 4220748 N, in SW ¼ SW ¼ sec. 20, T.45 N., R.11 E., New Mexico Principal Meridian, Saguache County, CO, Hydrologic Unit 13010003, on left bank 300 ft north of road, 9 mi southeast of Mineral Hot Springs.
Drainage Area and Period of Record.--	12.8 mi ² from topographical map. March 1999 to current year.
Equipment.--	Data collection platform (Sutron Satlink2), and SDR shaft encoder in metal pipe shelter and well. Primary reference gage is a drop tape from reference point on shelf. No outside gage. Graphic water-stage recorder removed and shaft encoder upgraded October 18, 2010.
Hydrologic Conditions.--	Predominantly undeveloped steep alpine and sub-alpine terrain.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP and SDR log as backup. Many DCP transmissions were missing and data was filled from logged data without loss of accuracy. Record is complete and reliable except for Nov. 12-28, 2010 when ice in well was affecting float, and Nov. 29, 2010 through Mar. 24, 2011 when station was closed for the winter. Two missing unit values on Oct. 18, 2010 were estimated during equipment upgrade. The stage-discharge relation was affected by ice Nov. 10, 11, 2010. Four flush corrections were identified ranging from -0.01 ft to +0.02 ft and were prorated back to the previous inflection point.
Datum Corrections.--	Levels were run to the Reference Point (RP) inside the gage on Sep. 12, 2011 using B.M. No. 2 as base. The gage reference point elevation was within allowable limits, therefore no correction was made. Two-peg tests were performed on the Lietz level (SN 130869) on July 28, 2011 and September 26, 2011 an adjustment of .0017 was made September 26, 2011.
Rating.--	The control at all stages is rock piled in stream channel 10 feet below gage. Some minor shifting of control will occur from movement of rocks. Rating No. 04-1 was used again this water year. Seventeen discharge measurements (Nos. 183-199) were made during the year ranging in discharge from 5.09 to 23.6 cfs. They cover the range experienced except for the lower daily flows on Feb. 2-13, Feb. 20, 21, 24, Mar. 4-11, 14, 23, 2011 and the higher daily flows on May 29, Jun. 2-9, 2011. The peak flow of 31.6 cfs occurred at 2045 on May 29, 2011 at a gage height of 3.28 ft with a shift of 0.06 ft It exceeded high measurement No. 194 (GH=3.15 ft), made June 8, 2011, by 0.13 ft in stage.
Discharge.--	Shifting control method was used during all open water periods. The stage-discharge relation was affected by ice and discharge estimated Nov. 10, 11, 2010. Two shift curves were used to distribute shifts from Mar. 24 to Jul. 14, 2011. Shift curve VS11-3 was used until May 28 when an apparent control change occurred. Shift curve VS11-4 was used after the control change. From Aug. 12 to 15 the shift was estimated from gage-height change when rock dam was constructed and removed. During other periods, shifts were defined by measurements and distributed by time. VS11-4 crosses the rating, but by less than 5%. All shifts were given full weight and applied as defined except for Nos. 191, 193, 195, 197, and 198, which were adjusted by as much as 6% to smooth shift distribution. Measured shifts ranged from -0.04 to +0.06 feet.
Special Computations.--	Discharge for periods of no gage-height and ice affected record was estimated using discharge measurements, adjacent good record, and air temperature data from Crestone 1 SE weather station and SANDUNCO.
Remarks.--	Record is good, except for periods of unreliable gage-height and ice affected record, which are estimated and poor. The high water period from May 28 to Jun. 13, 2011, including the instantaneous peak, should be considered fair. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	Since some of the positive shifting at higher flows may be due to well drawdown, an outside reference gage should be installed to verify.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08226700 COTTON CREEK NEAR MINERAL HOT SPRINGS

RATING TABLE-- COCRMICO04-1 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

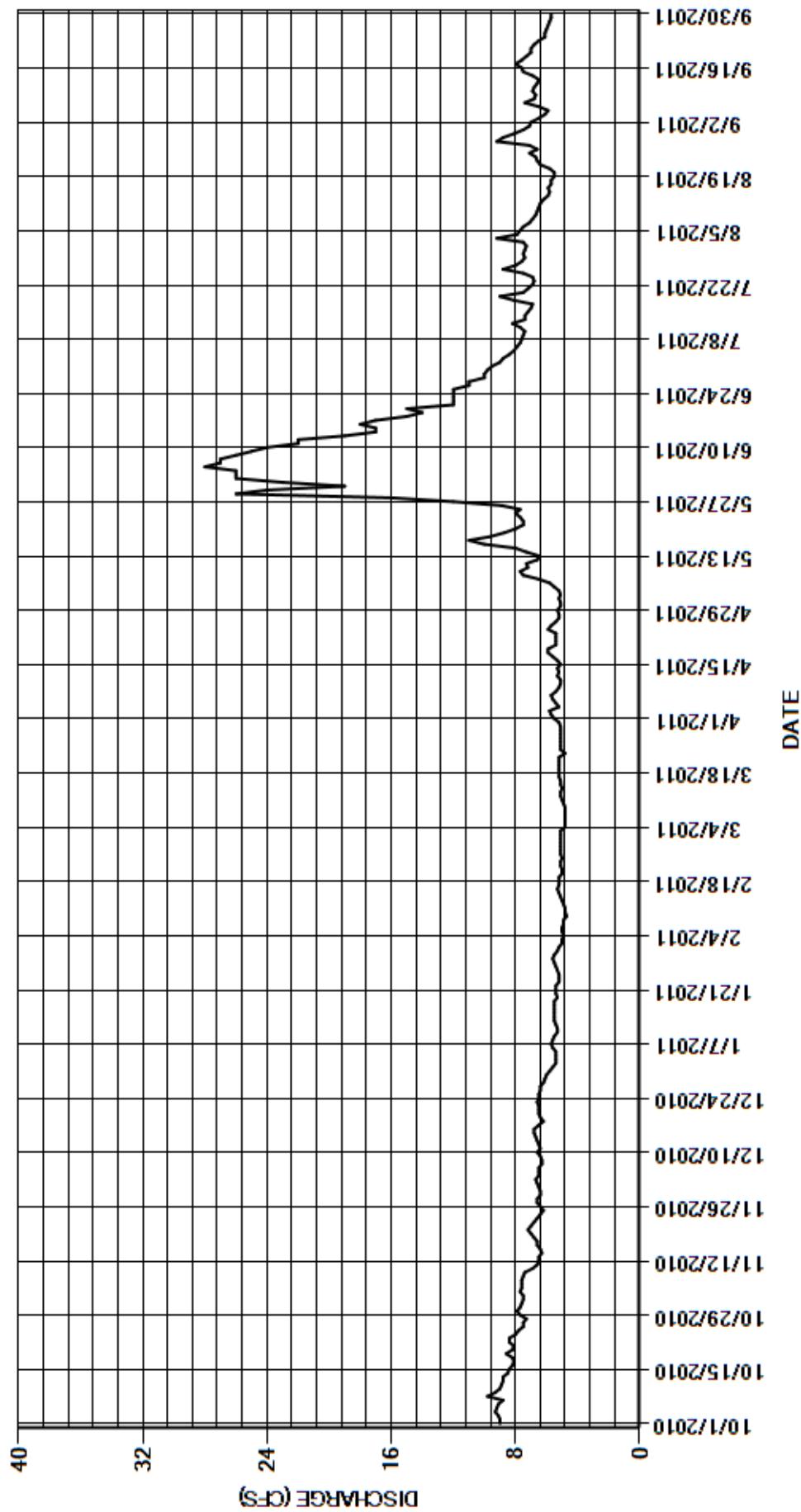
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.0	7.6	e6.5	e5.6	e5.2	e5.1	5.5	5.1	23	9.5	7.3	7.1
2	9.0	7.5	e6.6	e5.4	e5.0	e5.1	5.7	5.2	26	9.0	7.5	7.0
3	9.1	7.5	e6.7	e5.4	e5.0	e5.1	5.8	5.1	26	8.8	9.2	6.5
4	9.3	7.7	e6.5	e5.4	e4.9	e4.8	5.2	5.2	26	8.4	7.9	6.1
5	9.2	7.6	e6.5	e5.4	e5.0	e4.8	5.4	5.5	28	8.1	7.7	5.9
6	9.1	7.6	e6.5	e5.6	e5.0	e4.8	5.6	5.8	27	7.9	7.5	6.5
7	8.8	7.6	e6.3	e5.7	e4.9	e4.8	5.7	6.5	27	7.7	7.1	7.4
8	9.8	7.5	e6.3	e5.6	e4.9	e4.8	5.4	7.5	26	7.6	6.9	6.8
9	9.3	7.4	e6.4	e5.5	e4.7	e4.8	5.2	7.7	25	7.5	6.7	6.7
10	9.0	e6.9	e6.6	e5.3	e4.8	e4.9	5.1	7.2	24	7.4	6.6	6.9
11	8.9	e6.6	e6.4	e5.3	e4.8	e5.0	5.1	7.3	22	7.7	6.5	6.8
12	8.8	e6.5	e6.5	e5.4	e4.9	e5.1	5.3	6.6	22	8.2	6.4	6.6
13	8.8	e6.5	e6.6	e5.5	e5.0	e5.1	5.2	6.5	19	7.4	6.2	6.5
14	8.5	e6.3	e6.7	e5.5	e5.1	e5.0	5.3	7.3	17	7.4	5.9	6.9
15	8.4	e6.4	e6.8	e5.5	e5.2	e5.1	5.1	8.0	17	7.2	5.8	7.5
16	8.2	e6.6	e6.8	e5.5	e5.3	e5.1	5.3	10	18	7.0	5.9	7.6
17	8.1	e6.6	e6.5	e5.5	e5.2	e5.2	5.6	11	17	6.9	5.7	8.0
18	8.2	e6.8	e6.2	e5.5	e5.2	e5.2	5.9	9.6	15	8.1	5.7	7.6
19	8.6	e7.0	e6.4	e5.3	e5.2	e5.2	5.9	8.7	14	9.0	5.5	7.3
20	8.2	e7.2	e6.5	e5.4	e5.0	e5.2	5.4	8.0	15	7.5	5.5	7.0
21	8.1	e7.0	e6.5	e5.4	e5.0	e5.2	5.4	7.5	12	7.2	5.8	7.0
22	8.4	e6.8	e6.5	e5.4	e5.1	e5.2	5.4	7.5	12	6.9	6.4	6.8
23	8.4	e6.6	e6.6	e5.2	e5.1	e4.8	5.4	7.7	12	6.8	6.6	6.5
24	8.0	e6.4	e6.5	e5.2	e5.0	e5.1	5.9	8.0	12	6.9	6.7	6.1
25	7.8	e6.2	e6.5	e5.2	e5.1	5.1	5.7	7.7	12	7.5	7.1	6.1
26	7.5	e6.4	e6.4	e5.3	e5.1	5.1	5.4	8.9	11	8.8	6.6	6.0
27	7.5	e6.6	e6.4	e5.4	e5.1	5.1	5.2	12	11	8.0	7.1	5.9
28	7.3	e6.6	e6.2	e5.5	e5.1	5.1	5.2	16	10	7.6	9.2	5.8
29	7.7	e6.4	e6.1	e5.6	---	5.1	5.3	26	10	7.4	8.8	5.7
30	7.9	e6.4	e6.0	e5.5	---	5.1	5.1	24	9.8	7.5	8.1	5.7
31	7.7	---	e5.8	e5.3	---	5.2	---	19	---	7.4	7.5	---
TOTAL	262.6	206.8	199.8	168.3	140.9	156.3	162.7	288.1	545.8	240.3	213.4	200.3
MEAN	8.47	6.89	6.45	5.43	5.03	5.04	5.42	9.29	18.2	7.75	6.88	6.68
AC-FT	521	410	396	334	279	310	323	571	1080	477	423	397
MAX	9.8	7.7	6.8	5.7	5.3	5.2	5.9	26	28	9.5	9.2	8.0
MIN	7.3	6.2	5.8	5.2	4.7	4.8	5.1	5.1	9.8	6.8	5.5	5.7
CAL YR	2010	TOTAL	3818.2	MEAN	10.5	MAX	56	MIN	3.8	AC-FT	7570	
WTR YR	2011	TOTAL	2785.3	MEAN	7.63	MAX	28	MIN	4.7	AC-FT	5520	

MAX DISCH: 31.6 CFS AT 20:45 ON MAY 29,2011 GH 3.28 FT SHIFT 0.06 FT

MAX GH: 3.28 FT AT 20:45 ON MAY 29,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08226700 COTTON CREEK NEAR MINERAL HOT SPRINGS
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
WILD CHERRY CREEK NEAR CRESTONE
Water Year 2011

Location.--	Lat 38°6'1", long 105°46'6" referenced to North American Datum of 1983 (Mirage, CO quad, scale 1:24,000), UTM Zone 13 432636 E and 4217217 N, in SE ¼ SW ¼ sec. 33, T.45 N., R.11 E., New Mexico Principal Meridian, Saguache County, CO, Hydrologic Unit 13010003, on right bank 50 ft north of right branch of trail, 12 mi southeast of Mineral Hot Springs, 8 mi northwest of Crestone, CO.
Drainage Area and Period of Record.--	4.5 mi ² from topographical map. March 1999 to current year.
Equipment.--	Graphic water stage recorder, data collection platform (Sutron Satlink2) and a float-operated shaft encoder in a 4-foot diameter culvert pipe well and shelter. The primary reference gage is a drop tape from reference point on shelf. No outside gage. The graphic water-stage recorder was removed and the shaft encoder was replaced with an SDR on Oct. 18, 2010.
Hydrologic Conditions.--	Alpine and subalpine undeveloped National Forest.
Gage-Height Record.--	Primary record is from fifteen minute DCP transmitted data with DCP log and chart record as backups until Oct. 18, 2010 when chart recorder was removed. Record is complete and reliable except for Nov. 12-28, 2010 when the well was frozen; and Nov. 29 through Mar. 23, 2011 when station was closed for the winter. There was a -0.02 shaft encoder correction on May 31 and a +0.01 shaft encoder correction on Aug. 3, which were prorated back to the previous visit. There were trash corrections of -0.10 ft (branch on control) on May 31, 2011 and -0.07 ft (rocks on control) on Aug. 3, 2011. These corrections were accounted for in the shift distributions.
Datum Corrections.--	Levels were not run during WY 2011. Levels were last run to the Reference Point (RP) inside the gage on Sep. 4, 2009 using B.M. 1 as base. The RP elevation was within allowable limits; so no corrections were required or made.
Rating.--	Control at all stages is a rock weir about 6 feet below the gage. Rating No. 2 was used Oct. 1-13, 2010. Rating No. 3 was developed using measurements from the 2011 water year and used Oct. 13, 2010 through Sep. 30, 2011. Rating No. 3 is poorly defined and will be revised or replaced as more measurements are made at the site. Shifting occurs due to scour, fill, and movement of rocks. Fifteen discharge measurements (Nos. 182-196) were made this year ranging in discharge from 0.40 to 4.57 cfs. They cover the discharge range experienced except for the lower daily flows on Mar. 24-30, 2011 and higher daily flows on May 29 - Jun. 7, 2011. The peak flow of 7.72 cfs occurred at 2230 on May 29, 2011 at a gage height of 2.46 ft with a shift of -0.09 ft. It exceeded high measurement No. 191 (GH=2.15), made May 31, 2011, by 0.31 ft in stage.
Discharge.--	Shifting control method was used during all open water periods. A variable shift curve was used to apply shifts from Mar. 23 to May 29, 2011. During other periods, shifts were applied as defined by measurements and distributed by time and events. Measurement shifts ranged from -0.06 to +0.12 ft. All were given full weight except No. 189, which was rated poor and adjusted by 9% (0.01 ft) to smooth shift distribution. Due to poor rating, the peak flow data should be considered poor.
Special Computations.--	Discharge for period of no gage-height record were estimated using discharge measurements and weather records from Sand Creek at the Great Sand Dunes National Park.
Remarks.--	Due to instability of control and uncertainty in measurements and rating, record is poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	New control. Levels should be ran in 2012.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

WILD CHERRY CREEK NEAR CRESTONE

RATING TABLE-- CHECRECO02 USED FROM 01-OCT-2010 TO 13-OCT-2010
CHECRECO03 USED FROM 13-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

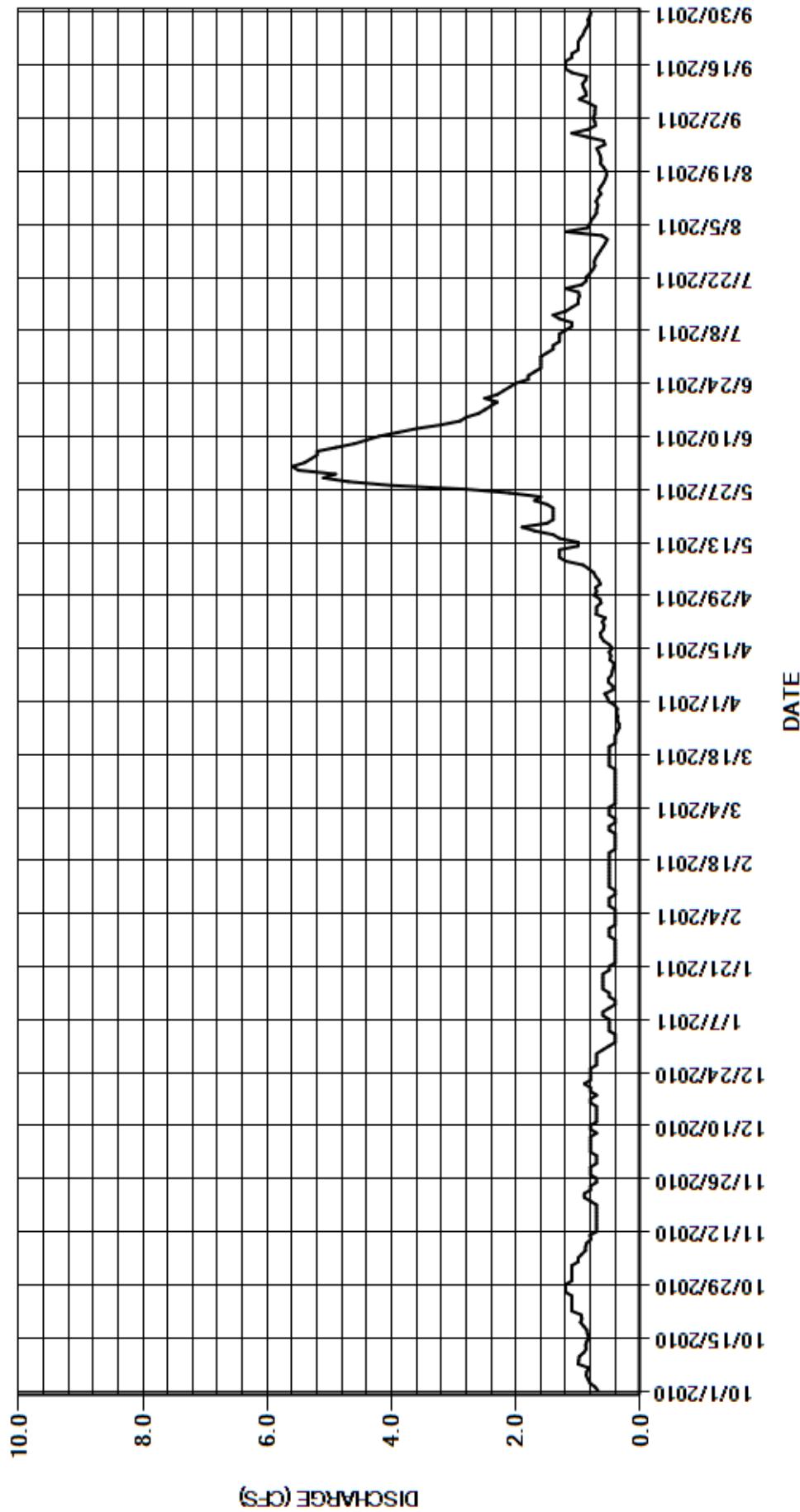
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.68	1.1	e0.70	e0.40	e0.40	e0.40	0.51	0.72	5.5	1.6	0.53	0.73
2	0.73	1.1	e0.70	e0.40	e0.40	e0.50	0.53	0.64	5.6	1.5	0.62	0.76
3	0.81	1.1	e0.80	e0.40	e0.40	e0.50	0.57	0.67	5.4	1.4	1.2	0.73
4	0.84	1.0	e0.80	e0.50	e0.40	e0.50	0.44	0.72	5.3	1.4	0.85	0.73
5	0.87	1.0	e0.80	e0.50	e0.40	e0.40	0.44	0.75	5.2	1.3	0.81	0.72
6	0.86	0.94	e0.80	e0.50	e0.50	e0.40	0.51	0.83	5.2	1.3	0.79	0.83
7	0.83	0.88	e0.80	e0.50	e0.50	e0.40	0.51	0.92	4.9	1.3	0.74	0.98
8	1.0	0.88	e0.70	e0.60	e0.50	e0.40	0.46	1.2	4.6	1.2	0.70	0.87
9	0.99	0.86	e0.80	e0.60	e0.40	e0.40	0.45	1.3	4.4	1.1	0.70	0.88
10	0.98	0.79	e0.80	e0.50	e0.40	e0.40	0.43	1.3	4.2	1.1	0.68	0.91
11	0.91	0.81	e0.70	e0.40	e0.50	e0.40	0.42	1.3	3.9	1.3	0.71	0.93
12	0.87	e0.70	e0.70	e0.40	e0.50	e0.40	0.49	1.0	3.6	1.4	0.68	0.88
13	0.88	e0.70	e0.70	e0.50	e0.50	e0.40	0.47	1.0	3.2	1.2	0.63	0.86
14	0.86	e0.70	e0.70	e0.50	e0.50	e0.40	0.50	1.3	2.9	1.1	0.67	1.1
15	0.83	e0.70	e0.70	e0.60	e0.50	e0.50	0.45	1.4	2.8	1.0	0.63	1.2
16	0.85	e0.70	e0.80	e0.60	e0.50	e0.50	0.50	1.7	2.6	1.0	0.59	1.2
17	0.86	e0.70	e0.80	e0.60	e0.50	e0.50	0.59	1.9	2.5	0.98	0.56	1.2
18	0.91	e0.70	e0.70	e0.60	e0.50	e0.50	0.63	1.5	2.4	0.99	0.54	1.1
19	0.96	e0.70	e0.80	e0.60	e0.50	e0.50	0.64	1.4	2.3	1.2	0.55	1.1
20	0.94	e0.80	e0.80	e0.50	e0.50	e0.50	0.59	1.4	2.5	0.94	0.59	1.0
21	0.95	e0.90	e0.90	e0.50	e0.40	e0.40	0.58	1.4	2.3	0.87	0.64	1.0
22	1.1	e0.90	e0.80	e0.40	e0.40	e0.40	0.61	1.4	2.2	0.87	0.63	1.0
23	1.1	e0.80	e0.80	e0.40	e0.40	e0.40	0.56	1.5	2.1	0.81	0.64	0.97
24	1.1	e0.80	e0.80	e0.40	e0.40	0.37	0.71	1.7	2.0	0.76	0.67	0.92
25	1.1	e0.70	e0.80	e0.40	e0.40	0.34	0.70	1.6	1.8	0.73	0.70	0.90
26	1.1	e0.70	e0.70	e0.40	e0.50	0.34	0.70	2.1	1.8	0.74	0.57	0.86
27	1.2	e0.80	e0.70	e0.40	e0.50	0.37	0.63	2.8	1.7	0.72	0.59	0.83
28	1.2	e0.80	e0.70	e0.40	e0.40	0.36	0.65	4.0	1.6	0.68	0.85	0.84
29	1.2	e0.80	e0.70	e0.50	---	0.38	0.74	4.7	1.6	0.64	1.1	0.81
30	1.1	e0.70	e0.60	e0.50	---	0.37	0.70	5.1	1.6	0.60	0.84	0.79
31	1.1	---	e0.50	e0.50	---	0.41	---	4.9	---	0.56	0.72	---
TOTAL	29.71	24.76	23.10	15.00	12.70	13.04	16.71	54.15	97.7	32.29	21.72	27.63
MEAN	0.96	0.83	0.75	0.48	0.45	0.42	0.56	1.75	3.26	1.04	0.70	0.92
AC-FT	59	49	46	30	25	26	33	107	194	64	43	55
MAX	1.2	1.1	0.90	0.60	0.50	0.50	0.74	5.1	5.6	1.6	1.2	1.2
MIN	0.68	0.70	0.50	0.40	0.40	0.34	0.42	0.64	1.6	0.56	0.53	0.72
CAL YR	2010	TOTAL	799.94	MEAN	2.19	MAX	25	MIN	0.40	AC-FT	1590	
WTR YR	2011	TOTAL	368.51	MEAN	1.01	MAX	5.6	MIN	0.34	AC-FT	731	

MAX DISCH: 7.72 CFS AT 22:30 ON MAY 29,2011 GH 2.46 FT SHIFT -0.09 FT

MAX GH: 2.46 FT AT 22:30 ON MAY 29,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

WILD CHERRY CREEK NEAR CRESTONE
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
RITO ALTO CREEK NEAR CRESTONE
Water Year 2011

Location.--	Lat 38°4'41", long 105°45'33" referenced to North American Datum of 1983 (Mirage, CO quad, scale 1:24,000), UTM Zone 13 433428 E and 4214738 N, in SE ¼ NE ¼ sec. 9, T.44 N., R.11 E., New Mexico Principal Meridian, Saguache County, CO, Hydrologic Unit 13010003, on right bank 300 ft east of parking area, 12 mi southeast of Mineral Hot Springs, 7 mi northwest of Crestone, CO.
Drainage Area and Period of Record.--	10.3 mi ² from topographical map. March 1999 to current year.
Equipment.--	Data collection platform (SatLink2), and a float-operated shaft encoder in a 4 ft diameter culvert pipe shelter and well. The primary reference gage is a drop tape from reference point on shelf. Graphic water-stage recorder removed and shaft encoder replaced with SDR on Oct. 19, 2010. A log cross-vane control structure was constructed on April 21, 2011. Outside cantilever gage installed April 22, 2011.
Hydrologic Conditions.--	Undeveloped steep alpine and subalpine terrain.
Gage-Height Record.--	Primary record is fifteen minute transmitted DCP data with DCP log and SDR log as backup. Record is complete and reliable, except for Nov. 25-28, 2010 when well was frozen, Nov. 29, 2010 to Mar. 23, 2011 when station was closed, and Apr. 20, 21, 2011 during new control construction. Missing data on May 3 and 4, 2011 was filled from SDR log with no loss of accuracy and one unit value on Oct. 19 was estimated from adjacent record. The stage-discharge relation was affected by ice Nov. 10-18, 23, 24, 2010 and Apr. 5, 6, 2011. There were two shaft encoder corrections, -0.01 ft on May 11 and +0.01 ft on Aug. 3. Both were prorated by time from previous visit.
Datum Corrections.--	Levels were run to the Reference Point (RP) inside the gage on Jul. 13, 2011 using B.M. No. 1 as base. The RP elevation was within allowable limits, so no correction was made or required, the outside cantilever gage was adjusted +0.04 ft. Two-pegs tests were performed on the Lietz level (SN 130869) on May 27, 2011 and July 28, 2011 no adjustments were required or made.
Rating.--	Control was a rock/cobble riffle until Apr. 21, 2011 when log cross-vane structure was constructed. Shifting on the rock/cobble control was caused by movement of rocks along with scour and fill in the gage pool. The log cross-vane structure shows minor shifting during low flows as a result of fill and scour in the gage pool. It is not anticipated that the new log control will scour or fill. Rating 4, created in 2006 and used until April 21, 2011, was no longer well defined after numerous control failures, but was used to define general rating shape with shifts applied. Rating 5 is well defined from 3 to 15 cfs and fairly well defined from 15 to 40 cfs. Seventeen measurements (Nos. 182 through 198) were made ranging in discharge from 1.95 cfs to 38.8 cfs. They cover the flow range experienced except for lower daily flows on Jan. 1-5, 10-12, 20, 23-25, Feb. 1-18, 20-27, Mar. 1-31, Apr. 1 and higher daily flows on May 29 and Jun. 1-8, 2011. The peak flow of 77.1 cfs occurred at 2115 on Jun. 5, 2011 at a gage height of 3.40 ft with a shift of 0.00 ft. The peak exceeded high measurement No. 193 (GH= 3.10 ft) made May 27, 2011 by 0.30 ft in stage.
Discharge.--	Shifting control method was used during all open water periods. The stage-discharge relation was affected by ice and discharge estimated Nov. 10-18, 23, 24, 2010 and Apr. 5, 6, 2011. Shifts were defined by measurements and distributed by time. Measurement shifts ranged from -0.27 to -0.35 ft on old control and rating 4 and from -0.03 to +0.04 ft on new control and rating 5. All measurements were given full weight except Nos. 195 and 198 which were rated fair and adjusted as much as 8% to smooth shift distribution.
Special Computations.--	Discharge for periods of no gage-height and ice affected record were estimated using discharge measurements, comparison with surrounding discharge records, and temperature record from Sand Creek at Great Sand Dunes National Park (SANDUNCO) and NOAA weather station Crestone 1 SE for December 2010. Discharge for Apr. 21 and 22, during construction of control, was estimated from adjacent good record.
Remarks.--	Record is fair, except for estimated daily values and the high water period from Jun. 2-8 including peak discharge, which are poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	More measurements needed above 15 cfs to define upper end of rating curve.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

RITO ALTO CREEK NEAR CRESTONE

RATING TABLE-- RITCRECO04 USED FROM 01-OCT-2010 TO 21-APR-2011
RITCRECO05 USED FROM 21-APR-2011 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

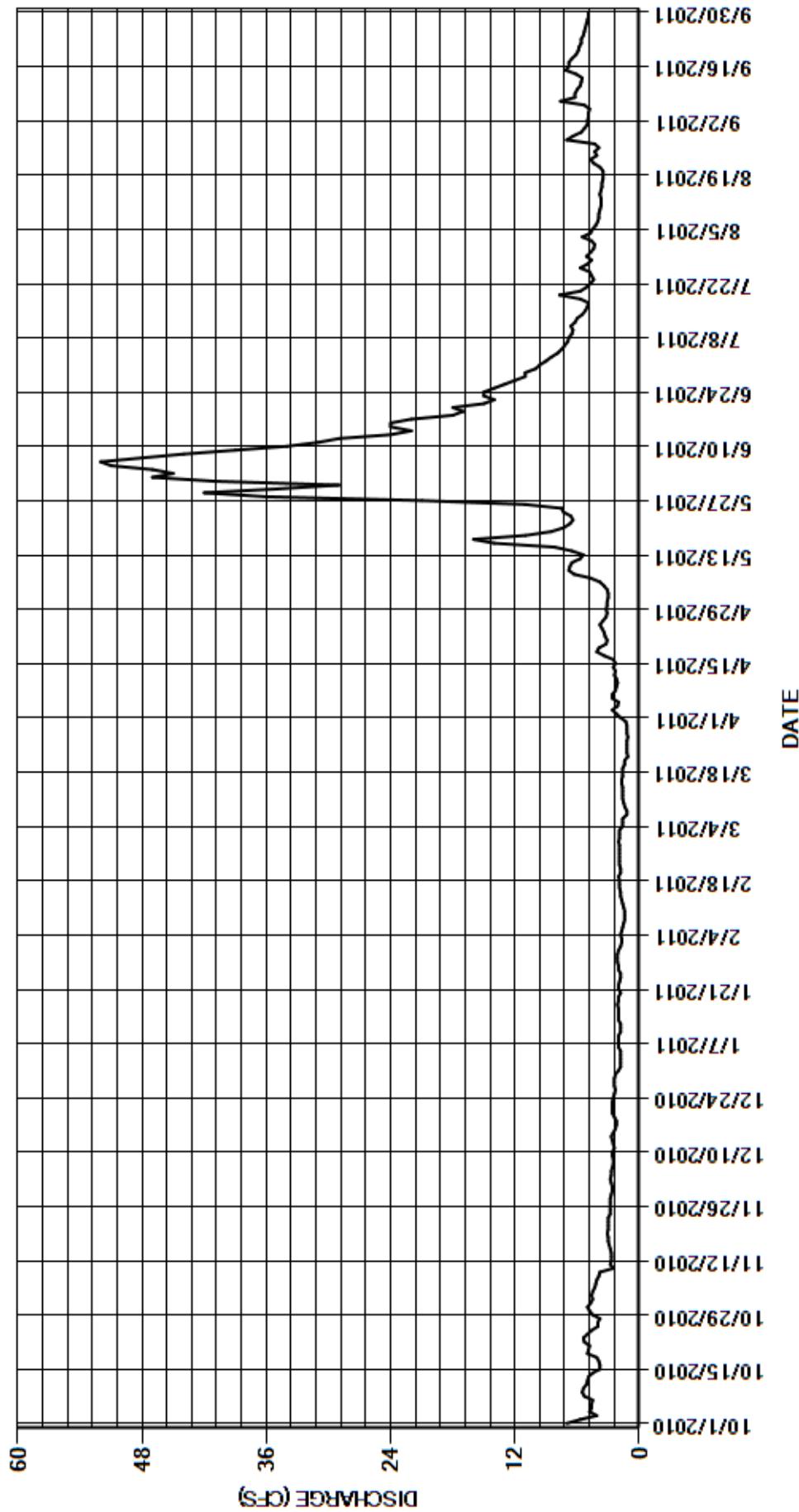
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.0	4.7	e2.6	e1.8	e1.8	e1.9	1.8	3.1	41	9.6	4.3	5.0
2	5.7	4.5	e2.7	e1.8	e1.7	e1.9	2.2	3.0	47	9.0	4.6	5.0
3	4.1	4.6	e2.8	e1.8	e1.7	e1.9	2.6	3.0	45	8.5	5.5	4.9
4	4.8	4.5	e2.7	e1.8	e1.8	e1.6	2.1	3.1	47	7.9	4.7	4.9
5	4.6	4.3	e2.7	e1.8	e1.7	e1.6	e2.0	3.4	51	7.5	4.5	4.8
6	4.6	4.2	e2.6	e2.0	e1.6	e1.6	e2.6	3.8	52	7.2	4.2	5.3
7	4.5	4.1	e2.5	e2.0	e1.5	e1.2	2.6	4.7	48	6.9	4.0	7.6
8	5.3	3.9	e2.5	e2.0	e1.4	e1.2	2.3	6.3	44	6.8	3.9	6.2
9	5.5	3.8	e2.6	e2.0	e1.4	e1.4	2.2	6.8	39	6.5	3.9	6.2
10	5.4	e2.5	e2.6	e1.8	e1.4	e1.5	2.1	6.7	34	6.4	3.8	6.0
11	5.1	e2.8	e2.4	e1.8	e1.5	e1.6	2.2	6.5	31	6.6	3.7	5.7
12	5.0	e2.7	e2.5	e1.8	e1.6	e1.6	2.4	5.7	29	6.2	3.7	5.6
13	4.9	e2.7	e2.6	e2.0	e1.7	e1.6	2.3	5.4	24	6.0	3.7	5.5
14	4.5	e2.7	e2.7	e2.0	e1.8	e1.6	2.5	6.5	22	5.5	3.8	6.1
15	3.8	e2.8	e2.5	e2.0	e1.8	e1.7	2.3	8.2	24	5.2	3.7	7.1
16	3.8	e2.9	e2.3	e2.0	e1.9	e1.7	2.5	14	24	5.0	3.6	6.8
17	3.9	e3.0	e2.2	e2.1	e1.9	e1.6	3.4	16	22	4.9	3.6	6.8
18	4.1	e3.0	e2.2	e2.0	e1.9	e1.6	4.1	11	18	5.7	3.5	6.5
19	5.0	3.1	e2.4	e2.0	e2.0	e1.6	3.9	8.5	17	7.7	3.5	6.1
20	4.9	3.0	e2.6	e1.8	e1.8	e1.4	e3.2	7.3	18	5.7	3.5	5.9
21	4.8	3.0	e2.6	e2.0	e1.8	e1.4	e3.1	6.7	15	5.1	3.8	5.8
22	5.3	3.0	e2.6	e2.0	e1.9	e1.1	3.3	6.4	14	4.7	4.4	5.6
23	5.4	e3.0	e2.6	e1.9	e1.9	e1.2	3.4	6.6	15	4.4	4.7	5.6
24	5.0	e2.8	e2.5	e1.8	e1.9	1.2	3.6	7.3	15	4.6	4.1	5.4
25	4.6	e2.8	e2.4	e1.8	e1.9	1.2	3.8	7.5	14	4.8	4.3	5.3
26	4.0	e2.8	e2.3	e2.0	e1.9	1.2	3.5	11	13	5.7	3.9	5.2
27	4.0	e2.8	e2.4	e2.0	e1.9	1.1	3.2	21	12	5.0	4.3	5.1
28	3.8	e2.8	e2.4	e2.1	e2.0	1.2	3.1	36	11	4.6	7.0	5.0
29	4.5	e2.7	e2.4	e2.1	---	1.2	3.2	42	11	5.1	6.4	4.9
30	4.8	e2.6	e2.3	e2.1	---	1.2	3.1	35	10	4.7	5.6	4.9
31	5.0	---	e2.0	e2.0	---	1.3	---	29	---	4.4	5.3	---
TOTAL	147.7	98.1	77.2	60.1	49.1	45.1	84.6	341.5	807	187.9	133.5	170.8
MEAN	4.76	3.27	2.49	1.94	1.75	1.45	2.82	11.0	26.9	6.06	4.31	5.69
AC-FT	293	195	153	119	97	89	168	677	1600	373	265	339
MAX	7.0	4.7	2.8	2.1	2.0	1.9	4.1	42	52	9.6	7.0	7.6
MIN	3.8	2.5	2.0	1.8	1.4	1.1	1.8	3.0	10	4.4	3.5	4.8
CAL YR	2010	TOTAL	4178.4	MEAN	11.4	MAX	163	MIN	2.0	AC-FT	8290	
WTR YR	2011	TOTAL	2202.6	MEAN	6.03	MAX	52	MIN	1.1	AC-FT	4370	

MAX DISCH: 77.1 CFS AT 21:15 ON JUN 05,2011 GH 3.40 FT SHIFT 0 FT

MAX GH: 3.40 FT AT 21:15 ON JUN 05,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

RITO ALTO CREEK NEAR CRESTONE
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
SAN ISABEL CREEK NEAR CRESTONE

Water Year 2011

Location.--	Lat 38°2'4", long 105°43'5" referenced to North American Datum of 1983 (Rito Alto Peak, CO quad, scale 1:24,000), UTM Zone 13 436985 E and 4209879 N, in SW ¼ NW ¼ sec. 25, T.44 N., R.11 E., New Mexico Principal Meridian, Saguache County, CO, Hydrologic Unit 13010003, on left bank 200 feet northwest of trail, 3 mi northwest of Crestone, CO.
Drainage Area and Period of Record.--	5.7 mi ² (from topographical map). March 1999 to current year.
Equipment.--	Data collection platform (Sutron Satlink2 with HDR GOES radio) and a float-operated SDR in a 4-foot diameter culvert shelter and well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. Graphic water-stage recorder was removed October 19, 2010.
Hydrologic Conditions.--	Undeveloped steep alpine and sub-alpine terrain.
Gage-Height Record.--	Primary record is 15 minute DCP transmitted data with DCP log and chart record as backup until Oct. 19, 2010 and DCP log and SDR log as backup after Oct. 19, 2010. Record is complete and reliable except for Nov. 27, 28 when well was frozen, Nov. 29, 2010 to Mar. 23, 2011 when station was closed for winter. The stage-discharge relation was affected by ice Nov. 10, 12-14, 17, 23, 25, 26, 2010. One unit value was estimated Oct. 19, 2010 when equipment was upgraded without loss of accuracy. There were two shaft encoder corrections. One was prorated from previous visit, and one was applied during measurement since shaft encoder adjustment was misidentified before and corrected after the measurement.
Datum Corrections.--	Levels were run to the Reference Point (RP) inside the gage on July 13, 2011 using B.M. No. 1 as base. The RP elevation was within allowable limits, so no correction was made or required. Two-peg tests were performed on the Lietz level (SN 130869) on May 27 and Jul. 28, 2011 and no adjustments were required or made.
Rating.--	Control is a boulder/cobble weir at low and medium flows, with some bank effect at higher flows. Stream bottom is mostly rounded rocks, cobbles, and gravel. The stage-discharge relation can be affected by persons moving rocks and piling logs on control and scour caused by high flows. Rating SANCRECO04 first used May 28, 2010 was used again this water year. This rating is well defined above approximately 1.5 cfs. Sixteen discharge measurements (Nos. 184-199) were made this year, ranging in discharge from 0.94 to 15.0 cfs. They cover the discharge range experienced, except for higher daily flows on May 28-30 and Jun. 1-7. The peak flow of 31.1 cfs occurred at 2000 on May 28, 2011 at a gage height of 4.10 ft with a shift of +0.01 ft. It exceeded high measurement No. 194 (GH = 3.92 ft), made Jun. 2, 2011, by 0.18 feet in stage. The minimum daily flow was 1.0 cfs on Feb. 2, 2011.
Discharge.--	Shifting-control method was used for all periods of open water record. Shifts were applied as defined by measurements and were distributed by time. Measurement shifts ranged from -0.02 to +0.04 ft. All were given full weight except for Nos. 185, 192-196, and 199 which were adjusted by as much as 7% to smooth shift distribution. One cleaning correction was noted Jun. 22, 2011 and was prorated from previous visit by time as a corrected shift. The two highest measurements, Nos. 193 and 194 were adjusted to a central +0.01 ft shift due to lack of rating definition in the 9 to 15 cfs flow range. Stage -discharge relation was affected by backwater from ice and discharge was estimated Nov. 10, 12-14, 17, 23, 25, 26, 2010.
Special Computations.--	Discharge for periods of no gage-height and ice affected record was estimated using discharge measurements, hydrographic comparison with Rito Alto Creek near Crestone and temperature data from Sand Creek at Great Sand Dunes National Park (SANDUNCO).
Remarks.--	Record is good, except for periods of no gage height and ice effect, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff .
Recommendations.--	Medium and high flow measurements are needed to better define the upper end of the rating.

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SAN ISABEL CREEK NEAR CRESTONE

RATING TABLE-- SANCRECO04 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

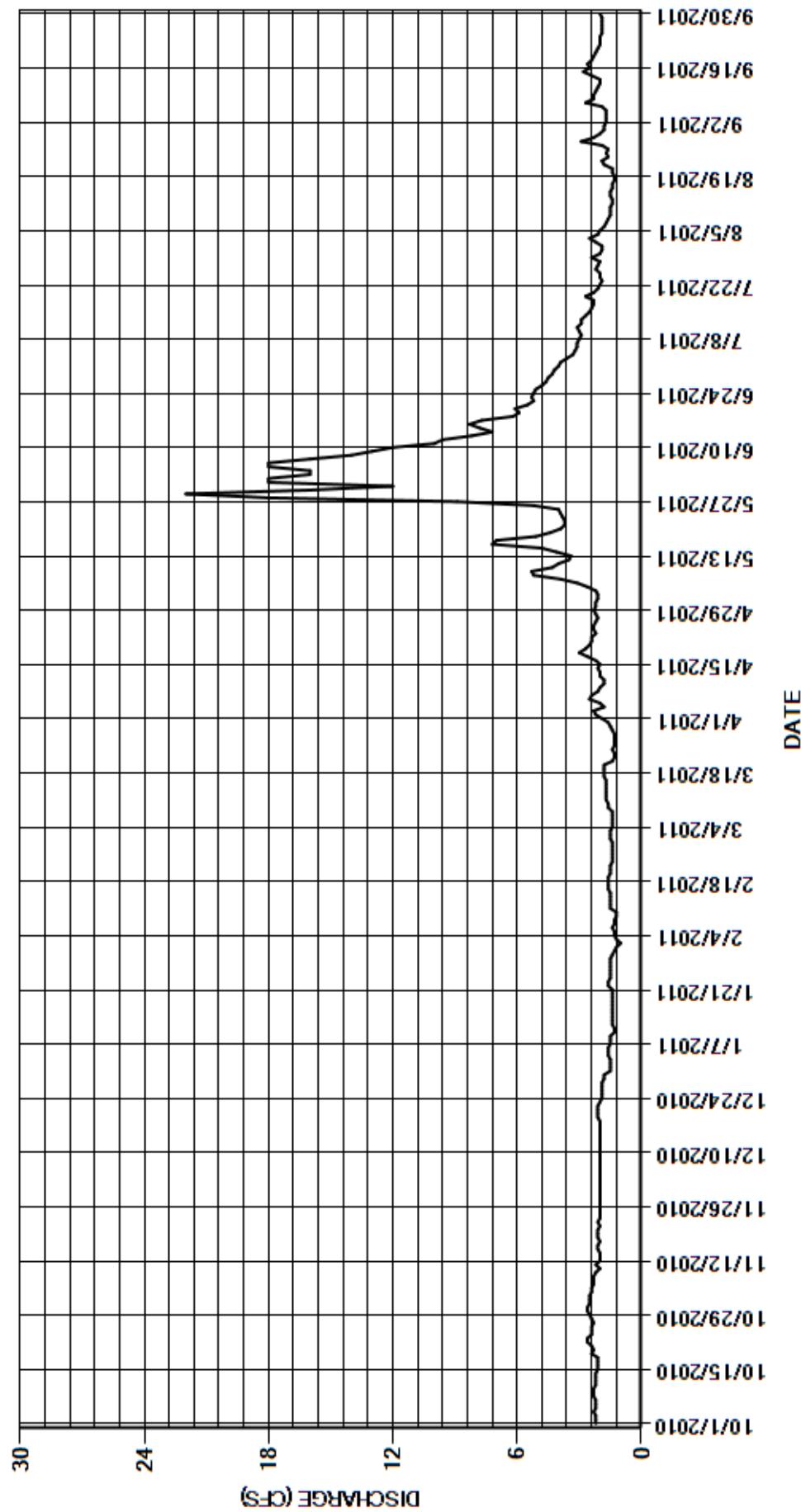
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.2	2.5	e2.0	e1.5	e1.2	e1.5	1.9	2.2	18	4.0	1.9	1.8
2	2.2	2.5	e2.0	e1.5	e1.0	e1.5	2.2	2.1	18	3.9	2.2	1.7
3	2.2	2.5	e2.0	e1.5	e1.2	e1.5	2.3	2.1	16	3.6	2.5	1.7
4	2.3	2.4	e2.0	e1.6	e1.3	e1.4	1.8	2.2	16	3.3	2.1	1.7
5	2.2	2.4	e2.0	e1.6	e1.3	e1.4	2.0	2.6	18	3.2	2.0	1.7
6	2.2	2.3	e2.0	e1.6	e1.4	e1.4	2.5	3.1	18	3.1	1.8	1.9
7	2.2	2.3	e2.0	e1.5	e1.3	e1.4	2.4	3.9	16	3.1	1.7	2.7
8	2.3	2.3	e2.0	e1.5	e1.3	e1.4	2.1	5.2	14	3.0	1.6	2.3
9	2.3	2.2	e2.0	e1.5	e1.2	e1.6	2.0	5.3	13	2.9	1.5	2.3
10	2.3	e2.0	e2.0	e1.3	e1.2	e1.6	1.8	4.3	12	3.0	1.5	2.2
11	2.2	2.2	e2.0	e1.3	e1.5	e1.7	1.8	4.0	10	3.1	1.5	2.1
12	2.2	e2.0	e2.0	e1.4	e1.5	e1.7	2.0	3.5	9.6	2.9	1.4	2.0
13	2.2	e2.0	e2.0	e1.4	e1.5	e1.7	2.0	3.4	8.2	2.9	1.4	2.0
14	2.2	e2.0	e2.0	e1.4	e1.5	e1.7	2.1	4.1	7.2	2.7	1.5	2.4
15	2.1	2.1	e2.0	e1.4	e1.5	e1.7	2.0	4.8	7.8	2.5	1.5	2.8
16	2.1	2.1	e2.0	e1.4	e1.6	e1.7	2.2	7.2	8.3	2.4	1.4	2.5
17	2.1	e2.0	e2.0	e1.4	e1.6	e1.8	2.6	7.0	7.7	2.3	1.4	2.6
18	2.1	2.1	e2.0	e1.4	e1.6	e1.8	3.0	5.1	6.2	2.3	1.3	2.4
19	2.4	2.1	e2.1	e1.4	e1.6	e1.8	2.7	4.4	5.9	2.7	1.3	2.3
20	2.3	2.1	e2.1	e1.4	e1.5	e1.8	2.5	3.9	6.1	2.3	1.4	2.2
21	2.4	2.0	e2.1	e1.4	e1.5	e1.4	2.4	3.7	5.5	2.1	1.4	2.1
22	2.6	2.1	e2.1	e1.6	e1.5	e1.3	2.4	3.7	5.2	2.0	1.8	2.0
23	2.6	e2.0	e2.0	e1.6	e1.4	e1.3	2.2	3.8	5.3	1.9	1.9	2.0
24	2.4	2.0	e1.9	e1.5	e1.4	1.4	2.3	3.9	5.2	2.0	1.6	2.0
25	2.4	e2.0	e1.9	e1.5	e1.4	1.3	2.3	4.0	5.1	2.0	1.7	1.9
26	2.4	e2.0	e1.9	e1.5	e1.4	1.3	2.2	5.2	4.8	2.2	1.6	1.9
27	2.3	e2.0	e1.9	e1.5	e1.4	1.3	2.1	8.9	4.6	2.1	1.9	1.9
28	2.4	e2.0	e1.9	e1.5	e1.4	1.3	2.2	18	4.5	2.0	2.9	1.9
29	2.5	e2.0	e1.8	e1.5	---	1.4	2.3	22	4.3	2.4	2.3	1.9
30	2.6	e2.0	e1.8	e1.4	---	1.5	2.2	16	4.2	2.0	2.0	2.0
31	2.6	---	e1.5	e1.3	---	1.6	---	12	---	1.9	1.8	---
TOTAL	71.5	64.2	61.0	45.3	39.2	47.2	66.5	181.6	284.7	81.8	53.8	62.9
MEAN	2.31	2.14	1.97	1.46	1.40	1.52	2.22	5.86	9.49	2.64	1.74	2.10
AC-FT	142	127	121	90	78	94	132	360	565	162	107	125
MAX	2.6	2.5	2.1	1.6	1.6	1.8	3.0	22	18	4.0	2.9	2.8
MIN	2.1	2.0	1.5	1.3	1.0	1.3	1.8	2.1	4.2	1.9	1.3	1.7
CAL YR	2010	TOTAL	2059.9	MEAN	5.64	MAX	69	MIN	1.3	AC-FT	4090	
WTR YR	2011	TOTAL	1059.7	MEAN	2.90	MAX	22	MIN	1.0	AC-FT	2100	

MAX DISCH: 31.1 CFS AT 20:00 ON MAY 28,2011 GH 4.10 FT SHIFT 0.01 FT

MAX GH: 4.10 FT AT 20:00 ON MAY 28,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SAN ISABEL CREEK NEAR CRESTONE
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08227000 SAGUACHE CREEK NEAR SAGUACHE
Water Year 2011

Location.--	Lat 38°9'48", long 106°17'26" referenced to North American Datum of 1983 (Lake Mountain NE, CO quad, scale 1:24,000), UTM Zone 13 386931 E and 4224736 N, in SE ¼ SE ¼ sec. 10, T.45 N., R.6 E., New Mexico Principal Meridian, Saguache County, CO, Hydrologic Unit 13010004, on left bank 0.2 mi downstream from Middle Creek and 10 mi northwest of Saguache, CO.
Drainage Area and Period of Record.--	595 mi ² . Aug. 1910-Sept. 1912, Jun. 1914 to current year. Monthly discharge only for some periods. Water-quality data available, Apr. 1993-Sep. 1995.
Equipment.--	Data collection platform (Sutron Model 8210 DCP with HDR GOES radio), a float-operated shaft encoder, a tipping-bucket rain gauge, and air temperature sensor in a CMP shelter and well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. Bank-operated cableway located 10 feet below gaging station. On May 9, 2011, the DCP was upgraded to a Sutron Satlink2, the shaft encoder was replaced with an SDR, and the chart recorder was removed.
Hydrologic Conditions.--	Gaging station is located in undeveloped irrigated ranch medows near lower mountain ranges. Flows at gage affected by diversions for irrigation and return flows from irrigation.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup. After May 9, 2011, DCP log and SDR log used as backup. Record is complete and reliable. The stage-discharge relation was affected by ice Oct. 26-31, Nov. 10, 2010 through Mar. 27, 2011. One missing unit value during data download was filled from chart on Nov. 8, 2010; and eight missing unit values during equipment upgrade were estimated on May 9, 2011. There was a +0.02 ft instrument correction on Feb. 3, 2011, which was prorated by time from previous visit.
Datum Corrections.--	Levels were not shot this year. Levels were last shot to the Reference Point (RP) inside the gage on Aug. 5, 2009 using R.M. No. 2 as base. The RP was within allowable limits, so no corrections were required or made.
Rating.--	Channel and gravel bar downstream are the low water controls. A bend in the channel approximately 100 feet downstream is the high water control. Scour, fill, and moss growth cause shifting. Rating No. 16 in use since Oct. 1, 1999 was used again this year. Evaluation of shifts is continuing to determine if a new rating is needed for the next water year. It is well defined from 10 to 500 cfs, but it is considered only fair outside that range. Sixteen measurements (Nos. 197-212) were made this year ranging in discharge from 21 to 151 cfs. They cover the range experienced except for the lower daily flows of Oct. 28, Nov. 10-19, 23-30, Dec. 19, 28-31, 2010, Jan. 1-5, 11, 12, 26, Feb. 1-3, 8-11, 21, 2011. The peak flow of 164 cfs occurred at 1930 on June 7, 2011 at a gage height of 2.32 ft. with a shift of +0.08 ft. It exceeded high measurement 207 made June 8, 2011 (gh = 2.24 ft) by 0.08 ft in stage.
Discharge.--	Shifting-control method was used for all periods of good record. The stage-discharge relation was affected by ice and discharge estimated Oct. 26-31, Nov. 10, 2010 through Mar. 27, 2011. Shifts were applied as defined by measurements and were distributed by time. Measurement shifts ranged from +0.01 to +0.10 ft. All open water measurements were given full weight except for Nos. 204, 206, 208, 210 and 211 which were adjusted as much as 4 percent to smooth shift distribution.
Special Computations.--	Discharge for periods of ice affected record was estimated using discharge measurements, weather records, partial record days, and comparison with nearby stations.
Remarks.--	Record is good except for periods of ice-affected record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	

STATE OF COLORADO
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08227000 SAGUACHE CREEK NEAR SAGUACHE

RATING TABLE-- SAGSAGCO16 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

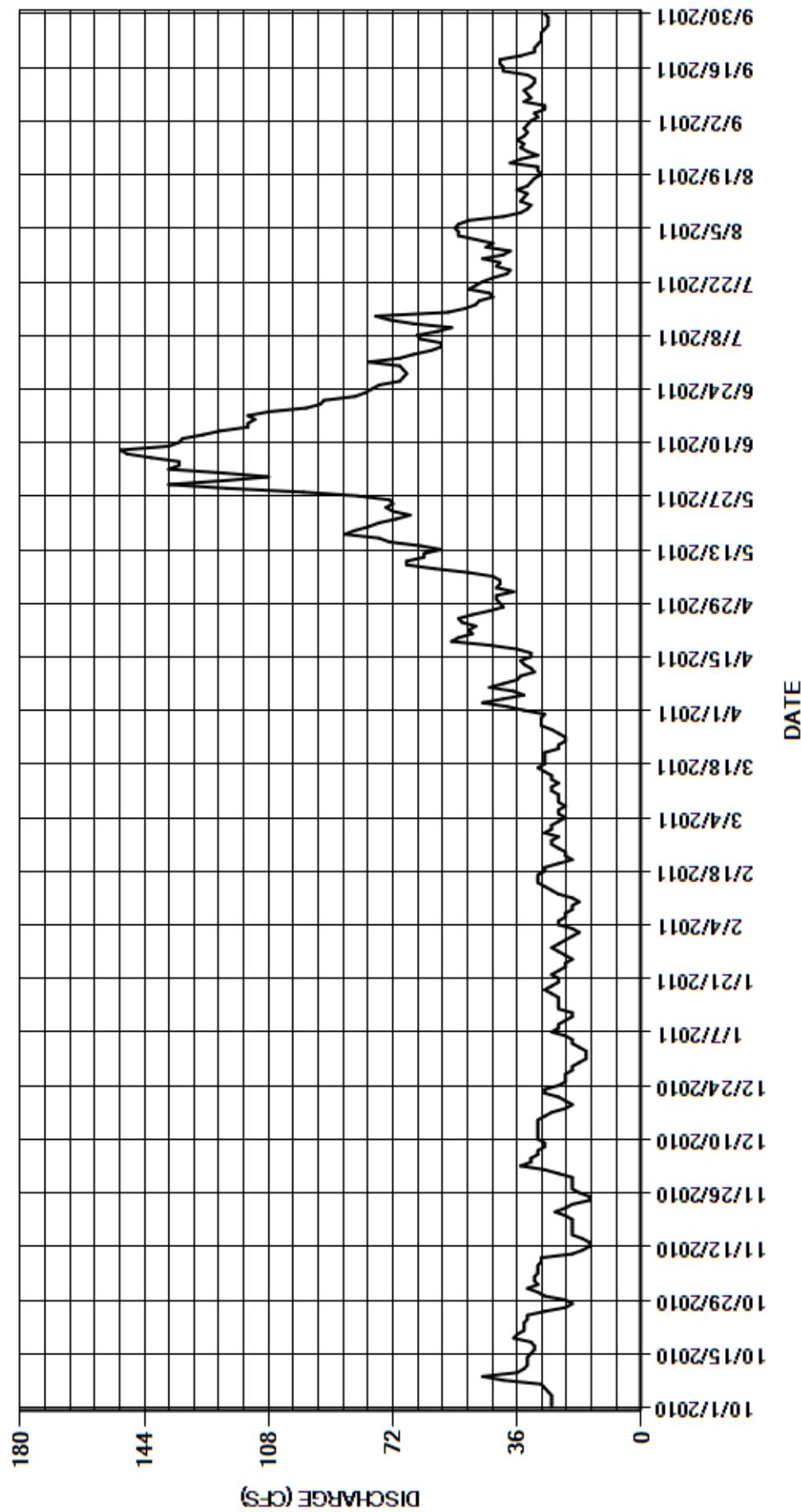
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	26	33	e24	e16	e20	e26	34	42	108	79	43	33
2	26	30	e28	e16	e18	e26	39	37	121	70	48	32
3	26	31	e35	e18	e20	e24	46	42	137	66	53	30
4	26	31	e32	e20	e24	e22	40	41	134	61	53	31
5	27	30	e32	e20	e24	e24	34	41	134	58	54	28
6	28	30	e30	e22	e22	e24	37	43	142	58	53	28
7	29	30	e30	e26	e22	e22	44	50	149	64	50	34
8	40	29	e28	e24	e20	e24	40	60	151	65	40	32
9	46	29	e28	e24	e20	e24	36	68	137	59	35	33
10	36	e20	e30	e22	e18	e24	35	68	134	55	33	34
11	34	e17	e30	e20	e20	e26	31	63	133	66	32	32
12	33	e15	e30	e20	e24	e26	32	63	127	73	35	31
13	33	e15	e30	e24	e26	e24	34	58	122	77	34	31
14	33	e17	e30	e24	e28	e26	35	64	114	56	33	33
15	32	e20	e30	e24	e30	e26	32	73	114	51	36	40
16	31	e20	e28	e24	e30	e28	32	76	112	48	33	40
17	31	e20	e26	e26	e30	e30	36	86	114	47	32	41
18	32	e20	e22	e28	e28	e28	44	83	108	43	31	41
19	37	e20	e20	e26	e28	e28	55	79	97	44	29	35
20	36	e22	e22	e24	e24	e28	53	76	93	50	30	31
21	34	e25	e24	e24	e20	e28	49	71	92	48	30	31
22	34	e22	e28	e26	e22	e24	50	67	83	46	38	30
23	34	e20	e28	e24	e22	e24	48	72	80	43	35	29
24	33	e15	e24	e22	e24	e22	52	74	78	39	30	29
25	33	e15	e22	e22	e26	e22	53	72	76	38	33	29
26	e28	e18	e22	e20	e26	e24	49	73	70	42	35	28
27	e22	e20	e22	e22	e24	e26	44	82	69	41	34	27
28	e20	e20	e20	e24	e28	29	40	98	68	46	36	27
29	e22	e20	e20	e26	---	29	41	120	69	40	34	27
30	e28	e20	e18	e24	---	29	42	137	70	38	33	28
31	e30	---	e16	e22	---	28	---	121	---	45	34	---
TOTAL	960	674	809	704	668	795	1237	2200	3236	1656	1159	955
MEAN	31.0	22.5	26.1	22.7	23.9	25.6	41.2	71.0	108	53.4	37.4	31.8
AC-FT	1900	1340	1600	1400	1320	1580	2450	4360	6420	3280	2300	1890
MAX	46	33	35	28	30	30	55	137	151	79	54	41
MIN	20	15	16	16	18	22	31	37	68	38	29	27
CAL YR	2010	TOTAL	18176	MEAN	49.8	MAX	224	MIN	14	AC-FT	36050	
WTR YR	2011	TOTAL	15053	MEAN	41.2	MAX	151	MIN	15	AC-FT	29860	

MAX DISCH: 164 CFS AT 19:30 ON JUN 07,2011 GH 2.32 FT SHIFT 0.08 FT

MAX GH: 2.34 FT AT 16:30 ON FEB 25,2011 (BACKWATER FROM ICE)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08227000 SAGUACHE CREEK NEAR SAGUACHE
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08227500 CRESTONE CREEK, NORTH NEAR CRESTONE
Water Year 2011

Location.--	Lat 38°0'49", long 105°41'34" referenced to North American Datum of 1983 (Rito Alto Peak, CO quad, scale 1:24,000), UTM Zone 13 439188 E and 4207550 N, in SE ¼ SE ¼ sec. 31, T.44 N., R.12 E., New Mexico Principal Meridian, Saguache County, CO, Hydrologic Unit 13010003, on right bank in canyon, 1.5 mi northeast of Crestone, CO, and 3.2 mi upstream from South Crestone Creek.
Drainage Area and Period of Record.--	10.7 mi ² . 1936 to current year (1936 to 1947 seasonal records only).
Equipment.--	Data collection platform (Sutron Satlink) and a float-operated shaft encoder in a 36 inch corrugated metal shelter and 36 inch concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. The graphic chart recorder and shaft encoder were removed on October 19, 2010 and an SDR was installed. Control is a concrete ramp flume approximately 4 feet below the gage.
Hydrologic Conditions.--	Undeveloped steep alpine and subalpine terrain.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and SDR log as backup. Chart record for backup to Oct. 19, 2010. Record is complete and reliable except for Nov. 15-29, 2010 when well was frozen; Nov. 30, 2010 - Feb. 23, 2011 when the station was closed; and Feb. 24 - Mar. 11, 2011 when inlets were frozen. The stage-discharge relation was affected by backwater from ice Nov. 10-14, 2010. Two missing unit values were estimated when equipment was upgraded Oct. 19, 2010. Two instrument corrections were made to the shaft encoder, +0.01 ft on Jun. 3 and -0.02 ft on Aug 26, 2011. Both corrections were prorated by time from the previous visit.
Datum Corrections.--	Levels were run Jul. 13, 2011 to the Reference Point (RP) inside the gage using BM #6 as base. The RP was within allowable limits, so no correction was made. The date of last two peg test on Lietz SN 130869 was May, 27, 2011 and no correction was made.
Rating.--	Control is a concrete ramp flume approximately 4 feet below the gage. Shifting occurs mainly due to the movement of streambed materials in and above gage pool. Rating No. 11 was used for the first two measurements into ice. Rating No. 12 was developed and used after coming out of ice. Sixteen measurements (Nos. 214-229) were made this year ranging in discharge from 1.28 to 29.7 cfs. They cover the discharge range experienced except for the lower daily flows on Jan 2, 3, 2011 and the higher daily flows on May 28-30 and Jun. 1-7, 2011. The peak flow of 57.9 cfs occurred at 2015 on May 28, 2011 at a gage height of 1.64 feet with a shift of 0 ft. It exceeded high measurement No. 224 (GH = 1.34 ft), made Jun. 3, 2011 by 0.30 feet in stage.
Discharge.--	Shifting control method was used during all open-water periods. The stage-discharge relation was affected by ice and discharge estimated Nov. 10-14, 2010. Shifts were applied as defined by discharge measurements and distributed by time. Measurement shifts ranged from +0.03 to +0.05 ft on Rating 11 and -0.01 to +0.01 ft on Rating 12. All were given full weight except for Nos. 214, 225, 226, 228, and 229 which were adjusted as much as 6% to smooth shift distribution.
Special Computations.--	Discharge for periods of unreliable gage height and ice affected record was estimated using discharge measurements and air temperature records from MEDSANCO.
Remarks.--	Record is good, except for periods of unreliable gage height and ice affected record, which are estimated and poor. Station maintained and records developed by Div 3 hydrographic staff .
Recommendations.--	Make more measurements at the upper end of the rating to help define the curve.

STATE OF COLORADO
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08227500 CRESTONE CREEK, NORTH NEAR CRESTONE

RATING TABLE-- NOCRESCO11 USED FROM 01-OCT-2010 TO 29-DEC-2010
NOCRESCO12 USED FROM 29-DEC-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.9	3.0	e1.5	e1.3	e1.8	e1.7	2.3	3.0	33	11	2.7	4.1
2	3.8	3.0	e1.5	e1.2	e1.6	e1.6	2.6	2.9	36	9.6	2.8	3.7
3	3.8	3.0	e1.6	e1.2	e1.6	e1.6	2.8	2.8	33	8.8	3.6	3.5
4	3.9	3.0	e1.6	e1.3	e1.7	e1.6	2.2	2.9	33	7.8	3.2	3.3
5	3.8	2.9	e1.6	e1.3	e1.7	e1.6	2.2	3.7	35	7.0	3.2	3.1
6	3.8	2.9	e1.7	e1.4	e1.8	e1.6	2.7	5.4	35	6.4	3.0	3.3
7	3.7	2.8	e1.7	e1.5	e1.8	e1.6	2.6	8.1	32	6.1	2.8	4.9
8	4.1	2.8	e1.7	e1.5	e1.7	e1.6	2.3	12	29	5.8	2.6	4.4
9	4.0	2.7	e1.6	e1.5	e1.5	e1.5	2.2	12	27	5.4	2.4	4.4
10	3.9	e2.3	e1.6	e1.4	e1.4	e1.5	2.1	10	26	5.4	2.3	4.1
11	3.7	e2.5	e1.6	e1.4	e1.4	e1.6	2.0	9.6	24	6.3	2.2	3.9
12	3.6	e2.2	e1.6	e1.5	e1.4	1.8	2.3	7.8	23	6.0	2.1	3.7
13	3.6	e2.5	e1.6	e1.5	e1.5	1.8	2.3	7.3	20	5.5	1.9	3.6
14	3.4	e2.5	e1.6	e1.6	e1.5	1.7	2.4	9.7	19	4.7	2.0	4.2
15	3.3	e2.4	e1.6	e1.8	e1.5	1.8	2.2	12	19	4.3	2.1	4.9
16	3.3	e2.4	e1.6	e2.0	e1.6	1.8	2.5	18	20	3.9	1.9	4.6
17	3.2	e2.4	e1.5	e2.2	e1.6	2.0	3.2	18	20	3.7	1.8	4.7
18	3.2	e2.5	e1.6	e2.2	e1.6	1.9	4.0	14	17	3.5	1.7	4.5
19	3.7	e2.6	e1.7	e2.2	e1.5	1.9	3.7	12	16	3.8	1.6	4.2
20	3.6	e2.6	e1.7	e2.1	e1.4	1.8	3.2	10	16	3.5	1.7	3.9
21	3.7	e2.7	e1.7	e2.1	e1.3	1.8	3.1	9.0	14	3.4	1.7	3.8
22	3.9	e2.6	e1.6	e2.1	e1.3	1.7	3.0	9.0	14	3.2	2.5	3.6
23	3.9	e2.4	e1.6	e2.1	e1.3	1.7	2.9	9.9	14	3.0	3.0	3.5
24	3.6	e2.2	e1.6	e2.2	e1.4	1.7	3.0	11	14	2.9	2.4	3.4
25	3.4	e2.0	e1.6	e2.3	e1.5	1.6	2.9	11	14	2.9	2.3	3.3
26	3.1	e1.9	e1.5	e2.4	e1.5	1.6	2.9	15	13	3.2	2.1	3.2
27	3.0	e1.8	e1.5	e2.4	e1.6	1.6	2.7	22	12	2.9	3.4	3.1
28	3.1	e1.6	e1.4	e2.5	e1.7	1.6	2.7	36	11	2.8	6.3	3.0
29	3.2	e1.6	e1.4	e2.5	---	1.6	3.0	42	11	3.1	6.3	2.9
30	3.2	e1.6	e1.3	e2.4	---	1.7	2.8	33	11	2.8	5.2	2.9
31	3.1	---	e1.3	e2.2	---	1.8	---	26	---	2.7	4.5	---
TOTAL	110.5	73.4	48.7	57.3	43.2	52.4	80.8	405.1	641	151.4	87.3	113.7
MEAN	3.56	2.45	1.57	1.85	1.54	1.69	2.69	13.1	21.4	4.88	2.82	3.79
AC-FT	219	146	97	114	86	104	160	804	1270	300	173	226
MAX	4.1	3.0	1.7	2.5	1.8	2.0	4.0	42	36	11	6.3	4.9
MIN	3.0	1.6	1.3	1.2	1.3	1.5	2.0	2.8	11	2.7	1.6	2.9

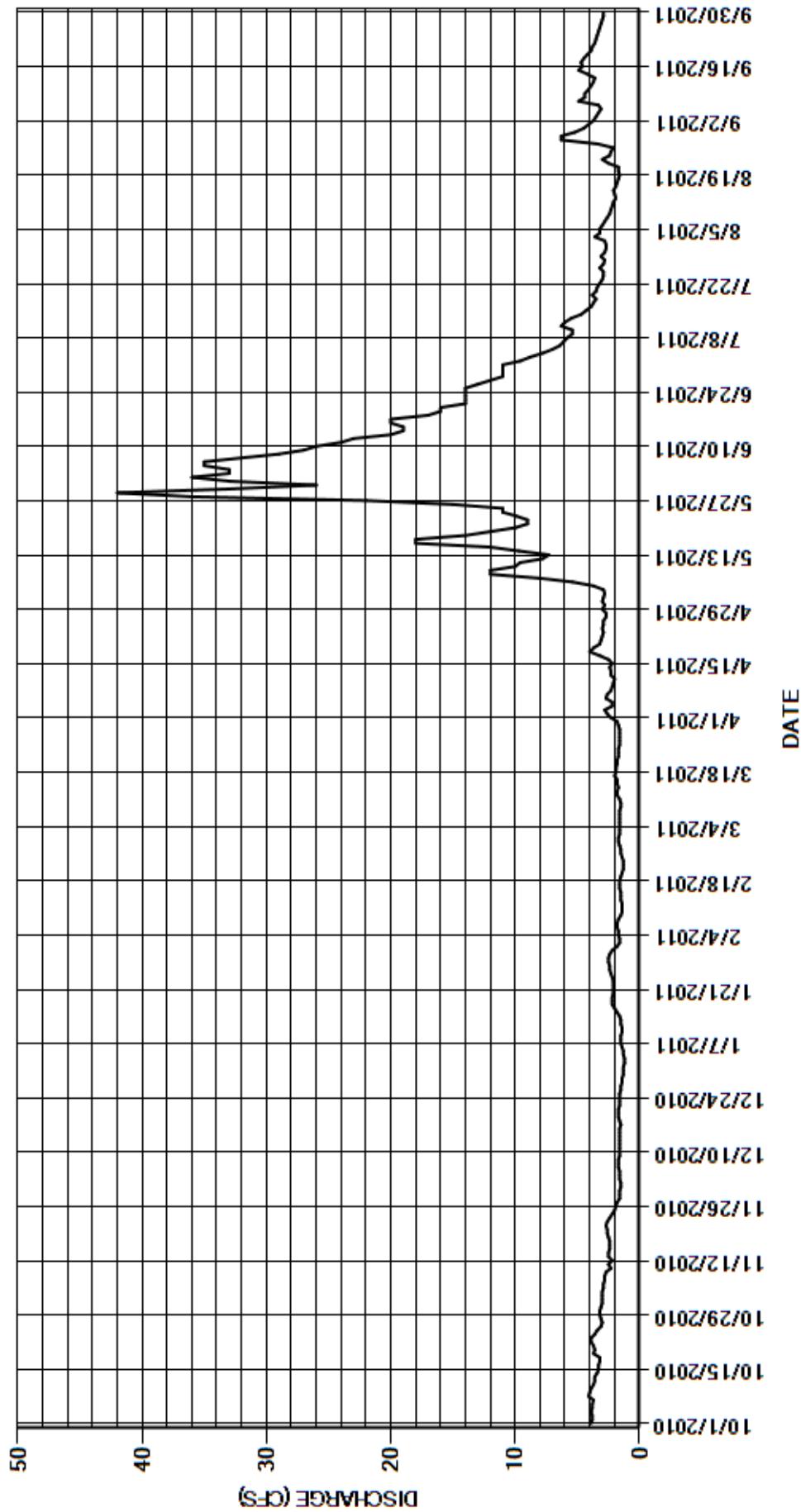
CAL YR	2010	TOTAL	3407.1	MEAN	9.33	MAX	132	MIN	1.2	AC-FT	6760
WTR YR	2011	TOTAL	1864.8	MEAN	5.11	MAX	42	MIN	1.2	AC-FT	3700

MAX DISCH: 57.9 CFS AT 20:15 ON MAY 28,2011 GH 1.64 FT SHIFT 0 FT

MAX GH: 1.64 FT AT 20:15 ON MAY 28,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08227500 CRESTONE CREEK, NORTH NEAR CRESTONE
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
SOUTH CRESTONE CREEK NEAR CRESTONE
Water Year 2011

Location.--	Lat 37°58'60", long 105°42'8" referenced to North American Datum of 1983 (Crestone, CO quad, scale 1:24,000), UTM Zone 13 438341 E and 4204184 N, in SW ¼ SE ¼ sec. 31, T.2 N., R.1 E., Luis Maria Baca No. 4 Survey, Saguache County, CO, Hydrologic Unit 13010003, on right bank 1 mile southeast of Crestone, CO.
Drainage Area and Period of Record.--	4.6 mi ² . Jun. 26, 1915 - Nov. 10, 1915 (some days missing), May 1936 to Nov. 1936, Apr. 1999 to current year.
Equipment.--	Data collection platform (Sutron Satlink2) and a float-operated SDR in a 2 ft diameter corrugated culvert pipe stilling well with small steel shelter on top. A 2-inch intake pipe attaches well to a 2.5 foot Parshall flume at the REW. The primary reference gage is a staff gage also located at REW. No changes this water year.
Hydrologic Conditions.--	Predominantly undeveloped steep alpine and sub-alpine terrain with extensive losses as stream traverses sandy valley margins.
Gage-Height Record.--	Primary record is fifteen minute DCP transmitted data with DCP and SDR logs as backup. Record is complete and reliable except for Nov. 30, 2010 – Mar. 22, 2011 when station was closed for winter. Gage was isolated for all or part of the day Oct. 1 – 21, Oct. 26 - Nov. 2, Nov. 10-22, Apr. 19-28, May 6, 7, and Jul. 16–23, Aug. 3, 28. When station was opened on Mar. 22, 2011, the SDR was set arbitrarily to 0.13 ft since the flume was dry and water level in well was below PZF. On Apr. 28, the flume was still dry, but an arbitrary -0.40 ft correction was made to the SDR to make the value close to reality. On May 9, there was flow at the flume and a -0.01 ft correction was made. Therefore a -0.41ft correction was applied from Mar. 22 to Apr. 28, then a -0.01 ft correction was applied to May 9. A +0.01 ft correction was made on Sep. 13 and prorated by time from Jul. 12 since that was the last visit with enough water to accurately reference the gage.
Datum Corrections.--	The last complete Parshall flume inspection was completed on Aug. 5, 2008. Levels indicate that the lateral slope of the flume floor at the staff gage is approximately 0.4% from REW, but is slightly concave with the middle being about 0.04 feet lower than at staff. Laterally, at the throat section, the flume is level. Inspection included measurement of all pertinent Parshall Flume dimensions. A partial inspection was performed on Jul. 30, 2010 after the intakes were replaced. This partial inspection showed the flume to be fairly level.
Rating.--	Control is a 2.5 foot Parshall flume in good condition. The flume and well ice up during winter, and sediment deposition in and above flume can cause minor shifting. Inlets isolate somewhere below 0.05 ft. Rating No. 1, a standard 2.5 foot Parshall flume rating, was used all year. Sixteen measurements (Nos. 184-199) were made this year ranging in discharge from 0 to 2.73 cfs. They cover the discharge range experienced except for higher daily flows on May 29, 30, Jun. 2-7. The peak flow of 3.94 cfs occurred at 0045 on May 29, 2011 at a gage height of 0.52 feet with a shift of 0.03 feet. It exceeded high measurement No. 194 (GH = 0.41 ft) by 0.11 feet in stage.
Discharge.--	Shifting control method was used for all periods of good record. Shifts were applied as defined by measurements and distributed by time. Measurement shifts ranged from -0.01 to +0.03 ft. All were given full weight except for No. 197, which was rated poor, and was not used because well was isolated. There was no flow Nov. 19-29, Dec. 1-17, Dec. 20 - Feb. 5, Feb. 7 - Mar. 7, Mar. 9 - May 6, Jul. 23 - Aug. 2, and Aug. 4-27 (199 days).
Special Computations.--	During the period when the gage was closed, the timing of flow stopping and starting was estimated by comparing precipitation events at UTEFTGCO and air temperature at SANDUNCO. It was assumed that flow would occur near precipitation events when temperatures were greater than 32 degrees F. Site observations during this period showed no flow. Periods when gage was isolated, as determined by minimum gage height less than 0.05 ft, were estimated using record during day that was good, and evaluating portion that was isolated.
Remarks.--	Record is good above 1.69 cfs, fair from 0.52 to 1.68 cfs, and poor below 0.52 cfs. Estimated record is also poor. Record accuracy statement is based on analysis of the standard 2.5 ft Parshall flume rating, where 0.52 cfs is the minimum free-flow capacity and 1.68 cfs is the point where 0.01 ft change in gage height is less than 5 percent change in streamflow. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	Verify point of isolation.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SOUTH CRESTONE CREEK NEAR CRESTONE

RATING TABLE-- SOUCRECO01 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e0.07	e0.09	e0.00	e0.00	e0.00	e0.00	0.00	0.00	2.5	0.55	0.00	0.65
2	e0.05	e0.09	e0.00	e0.00	e0.00	e0.00	0.00	0.00	3.1	0.48	0.00	0.60
3	e0.05	0.10	e0.00	e0.00	e0.00	e0.00	0.00	0.00	2.9	0.51	e0.02	0.56
4	e0.04	0.10	e0.00	e0.00	e0.00	e0.00	0.00	0.00	2.8	0.50	0.00	0.50
5	e0.03	0.10	e0.00	e0.00	e0.00	e0.00	0.00	0.00	3.0	0.44	0.00	0.44
6	e0.05	0.09	e0.00	e0.00	e0.10	e0.00	0.00	e0.00	3.2	0.42	0.00	0.43
7	e0.03	0.09	e0.00	e0.00	e0.00	e0.00	0.00	e0.23	3.0	0.38	0.00	0.67
8	e0.03	0.09	e0.00	e0.00	e0.00	e0.10	0.00	1.0	2.6	0.38	0.00	0.55
9	e0.09	0.09	e0.00	e0.00	e0.00	e0.00	0.00	1.1	2.3	0.34	0.00	0.60
10	e0.05	e0.09	e0.00	e0.00	e0.00	e0.00	0.00	0.76	2.1	0.41	0.00	0.61
11	e0.04	e0.09	e0.00	e0.00	e0.00	e0.00	0.00	0.63	1.9	0.54	0.00	0.62
12	e0.04	e0.12	e0.00	e0.00	e0.00	e0.00	0.00	0.49	1.8	0.53	0.00	0.57
13	e0.06	e0.12	e0.00	e0.00	e0.00	e0.00	0.00	0.36	1.6	0.48	0.00	0.53
14	e0.05	e0.09	e0.00	e0.00	e0.00	e0.00	0.00	0.47	1.4	0.39	0.00	0.77
15	e0.03	e0.05	e0.00	e0.00	e0.00	e0.00	0.00	0.63	1.2	0.35	0.00	0.80
16	e0.03	e0.04	e0.00	e0.00	e0.00	e0.00	0.00	1.2	1.2	e0.23	0.00	0.68
17	e0.03	e0.04	e0.00	e0.00	e0.00	e0.00	0.00	1.3	1.2	e0.20	0.00	0.68
18	e0.06	e0.04	e0.10	e0.00	e0.00	e0.00	0.00	1.0	1.0	e0.15	0.00	0.71
19	e0.15	e0.00	e0.10	e0.00	e0.00	e0.00	e0.00	0.92	0.93	e0.13	0.00	0.64
20	e0.09	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	0.76	1.1	e0.10	0.00	0.59
21	e0.11	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	0.64	0.91	e0.06	0.00	0.53
22	0.26	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	0.52	0.77	e0.02	0.00	0.49
23	0.30	0.00	e0.00	e0.00	e0.00	0.00	e0.00	0.48	0.69	e0.00	0.00	0.46
24	0.28	0.00	e0.00	e0.00	e0.00	0.00	e0.00	0.56	0.62	0.00	0.00	0.43
25	0.26	0.00	e0.00	e0.00	e0.00	0.00	e0.00	0.50	0.57	0.00	0.00	0.39
26	e0.09	0.00	e0.00	e0.00	e0.00	0.00	e0.00	0.73	0.53	0.00	0.00	0.34
27	e0.06	0.00	e0.00	e0.00	e0.00	0.00	e0.00	1.4	0.49	0.00	0.00	0.30
28	e0.07	0.00	e0.00	e0.00	e0.00	0.00	e0.00	2.5	0.49	0.00	e0.10	0.27
29	e0.15	0.00	e0.00	e0.00	---	0.00	0.00	3.3	0.48	0.00	0.53	0.21
30	e0.12	e0.20	e0.00	e0.00	---	0.00	0.00	3.2	0.52	0.00	0.62	0.18
31	e0.09	---	e0.00	e0.00	---	0.00	---	2.4	---	0.00	0.71	---
TOTAL	2.86	1.72	0.20	0.00	0.10	0.10	0.00	27.08	46.90	7.59	1.98	15.80
MEAN	0.092	0.057	0.006	0.000	0.004	0.003	0.000	0.87	1.56	0.24	0.064	0.53
AC-FT	5.7	3.4	0.4	0	0.2	0.2	0	54	93	15	3.9	31
MAX	0.30	0.20	0.10	0.00	0.10	0.10	0.00	3.3	3.2	0.55	0.71	0.80
MIN	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.48	0.00	0.00	0.18

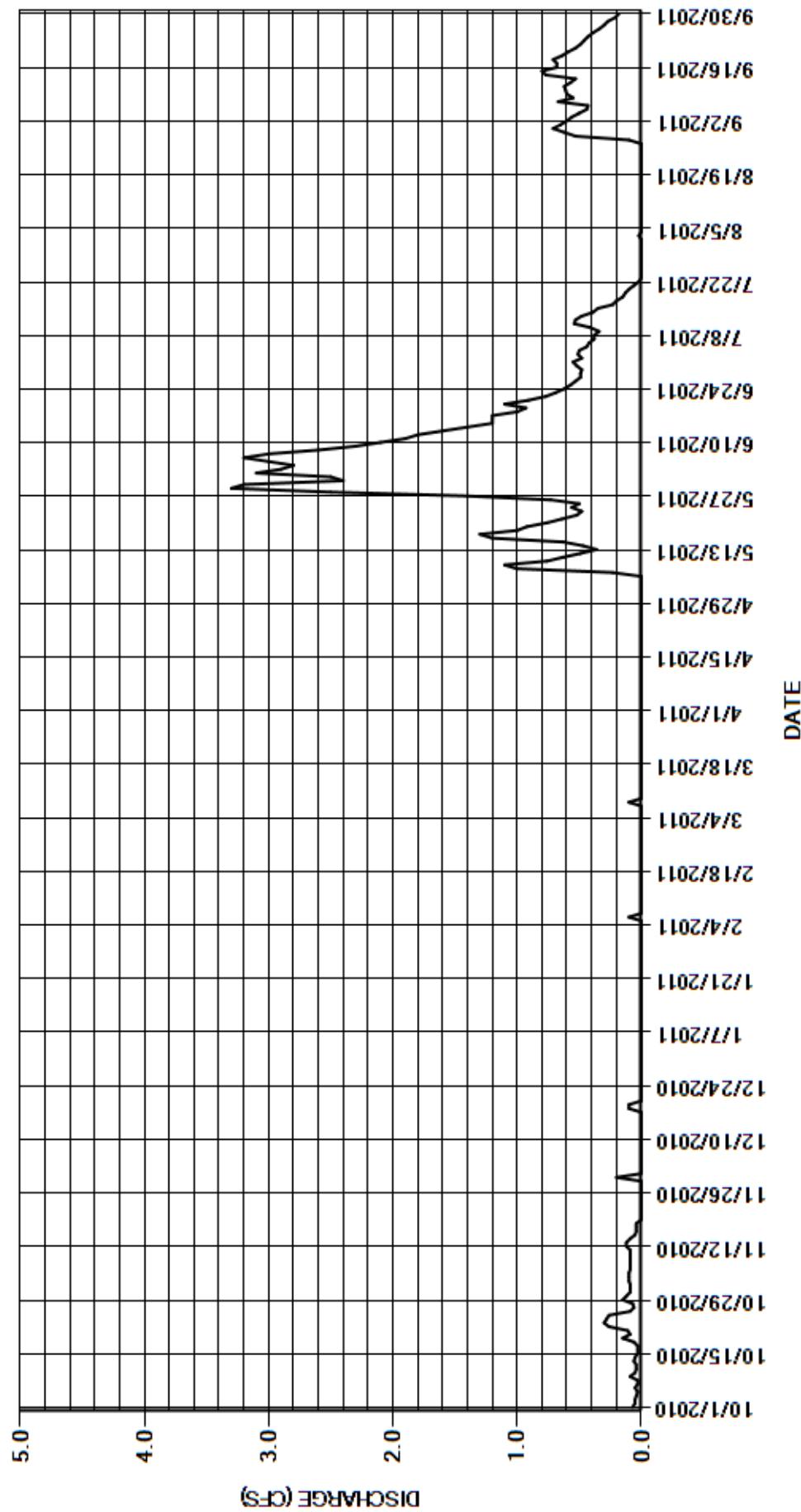
CAL YR	2010	TOTAL	284.65	MEAN	0.78	MAX	13	MIN	0.00	AC-FT	565
WTR YR	2011	TOTAL	104.33	MEAN	0.29	MAX	3.3	MIN	0.00	AC-FT	207

MAX DISCH: 3.94 CFS AT 00:45 ON MAY 29,2011 GH 0.52 FT SHIFT 0.03 FT

MAX GH: 0.52 FT AT 00:45 ON MAY 29,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH CRESTONE CREEK NEAR CRESTONE
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
WILLOW CREEK NEAR CRESTONE
Water Year 2011

Location.--	Lat 37°58'3", long 105°40'35" referenced to North American Datum of 1983 (Crestone, CO quad, scale 1:24,000), UTM Zone 13 440582 E and 4202428 N, in SW ¼ SW ¼ sec. 4, T.1 N., R.1 E., Luis Maria Baca No. 4 Survey, Saguache County, CO, Hydrologic Unit 13010003, on right bank 2 mi southeast of Crestone, CO.
Drainage Area and Period of Record.--	8.0 mi ² . April 1, 1999 to current year.
Equipment.--	Data collection platform (Sutron SatLink2), and a float-operated SDR in a 3-foot concrete pipe well and steel box shelter. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No changes this year.
Hydrologic Conditions.--	Mostly undeveloped steep alpine and sub-alpine terrain, minor subdivision for approximately 0.5 miles above gage.
Gage-Height Record.--	Primary record is 15-minute transmitted data with SDR and DCP logs as backup. Record is complete and reliable except for Nov. 20-29 when float was frozen, Nov. 30 - Mar. 22 when station was closed, and Jun. 3 when inlets were plugged. One +0.05 ft flush correction was identified Jun. 3 and prorated from previous inflection point for estimation purposes. Four shaft encoder corrections between -0.01 and +0.01 ft were prorated back to the previous visit except the correction on Jun. 3, which was identified after the measurement and taken during the measurement back to when the upper inlet riser was lowered into the water.
Datum Corrections.--	Levels were run to the Reference Point (RP) inside the gage on July 12, 2011 using BM 1 as base. The RP elevation was within allowable limits, so no correction was made or required. Two-peg tests were performed on the Lietz level (SN 130869) on May 27, 2011 and July 28, 2011 and no adjustments were required or made.
Rating.--	Control is a weir made of rocks and cobbles. The PZF on the control was measured twice during WY2011 ranging in stage from 2.03 ft to 2.25 ft. Bankfull stage is approximately 3.10 ft. as determined by levels ran July 29, 2010. Shifting occurs due to the movement of streambed materials at control and in approach, especially at higher stages. An attempt to stabilize the control was made during the gage shelter replacement in WY2010 by placing boulders at the toe of the control to prevent erosion; this does not appear to have significantly affected measurement shifts. Rating No. 3-3 was used until the station was closed November 30. While the station was closed shift patterns indicate more control change which warranted a new Rating No. 4 to improve record quality. Rating No. 4 is well defined up to approximately 15 cfs based on measurements 199 to 210. Seventeen measurements (Nos. 192-208) were made this year ranging in discharge from 0.37 to 9.92 cfs. Measurements cover the discharge range experienced except for higher daily flows on May 29 and Jun. 5-7 and lower daily flows on Feb. 25 - Apr. 2. The peak flow of 13.8 cfs occurred at 0015 on May 29, 2011 at a gage-height of 3.11 feet with a shift of 0.00 feet. It exceeded high measurement No. 203 (gh = 2.98 ft) by 0.13 ft in stage.
Discharge.--	Shifting control method was used for all open water periods. Shifts were applied by time proration prior to the gage freezing and all shifts were adjusted to the rating after the station was opened in the spring. Measurement shifts ranged from -0.12 to -0.11 ft while rating WILCRECO3-3 was in use and from -0.02 to +0.01 ft while rating WILCRECO4 was in use.
Special Computations.--	Discharge for periods of no gage-height and ice affected record was estimated using discharge measurements and weather records from SANDUNCO.
Remarks.--	Record is good, except for periods of no gage-height and ice-affected record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	High water measurements are needed to define upper end of rating.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

WILLOW CREEK NEAR CRESTONE

RATING TABLE-- WILCRECO03-3 USED FROM 01-OCT-2010 TO 30-NOV-2010
WILCRECO04 USED FROM 30-NOV-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.8	1.4	e0.70	e0.55	e0.40	e0.35	0.36	0.72	5.5	6.5	1.9	4.8
2	2.6	1.3	e0.70	e0.50	e0.40	e0.35	0.34	0.71	7.5	5.9	2.2	4.3
3	2.5	1.3	e0.70	e0.50	e0.40	e0.35	0.43	0.69	e7.1	5.5	3.3	3.9
4	2.3	1.3	e0.70	e0.50	e0.40	e0.35	0.48	0.65	7.5	5.1	4.0	3.4
5	2.2	1.3	e0.70	e0.50	e0.40	e0.35	0.51	0.64	10	4.6	3.9	3.0
6	2.2	1.3	e0.70	e0.50	e0.40	e0.35	0.54	0.64	11	4.3	3.4	2.9
7	2.0	1.3	e0.75	e0.50	e0.40	e0.35	0.60	0.66	11	4.4	3.0	3.7
8	2.2	1.3	e0.75	e0.50	e0.40	e0.35	0.59	0.83	9.6	4.4	2.6	4.1
9	2.2	1.3	e0.75	e0.50	e0.40	e0.35	0.60	1.3	8.9	4.4	2.3	4.7
10	2.1	1.3	e0.75	e0.45	e0.40	e0.35	0.61	1.8	8.4	4.7	2.0	4.6
11	1.9	1.2	e0.75	e0.40	e0.40	e0.35	0.59	1.9	8.3	5.8	1.8	4.3
12	1.8	e1.1	e0.75	e0.40	e0.40	e0.35	0.55	1.9	7.9	5.6	1.7	3.9
13	1.8	e1.1	e0.75	e0.40	e0.40	e0.35	0.51	1.7	7.0	5.1	1.5	3.6
14	1.7	e1.0	e0.75	e0.40	e0.40	e0.35	0.50	1.7	5.9	4.7	1.5	4.0
15	1.6	e0.90	e0.75	e0.40	e0.40	e0.35	0.49	2.0	5.8	4.3	1.4	4.1
16	1.5	e0.85	e0.75	e0.40	e0.40	e0.35	0.47	2.6	6.8	3.7	1.3	3.9
17	1.5	e0.80	e0.75	e0.40	e0.40	e0.35	0.46	3.5	7.8	3.3	1.1	3.9
18	1.4	e0.80	e0.75	e0.40	e0.40	e0.35	0.51	3.4	6.9	3.1	1.1	3.8
19	1.6	e0.70	e0.75	e0.40	e0.40	e0.35	0.60	3.0	6.1	3.7	1.0	3.5
20	1.6	e0.65	e0.75	e0.40	e0.40	e0.35	0.67	2.6	6.2	3.6	1.0	3.3
21	1.5	e0.70	e0.75	e0.40	e0.40	e0.35	0.72	2.3	5.3	3.2	1.0	3.1
22	2.0	e0.70	e0.75	e0.40	e0.40	e0.32	0.76	2.0	4.9	3.0	1.1	2.9
23	2.2	e0.70	e0.75	e0.40	e0.40	0.32	0.77	1.8	5.5	2.7	1.4	2.7
24	2.1	e0.70	e0.75	e0.40	e0.40	0.31	0.85	1.6	6.4	2.5	1.6	2.5
25	2.0	e0.70	e0.75	e0.40	e0.35	0.26	0.85	1.6	6.8	2.4	1.8	2.3
26	1.8	e0.70	e0.75	e0.40	e0.35	0.24	0.84	1.7	6.5	2.2	1.8	2.1
27	1.7	e0.70	e0.75	e0.40	e0.35	0.25	0.81	2.6	6.0	2.2	1.9	2.0
28	e1.5	e0.70	e0.75	e0.40	e0.35	0.29	0.79	6.5	5.7	2.2	3.3	1.9
29	1.5	e0.70	e0.75	e0.40	---	0.31	0.75	11	5.8	2.3	6.5	1.6
30	1.5	e0.70	e0.75	e0.40	---	0.32	0.74	8.9	6.0	2.2	6.3	1.5
31	1.4	---	e0.60	e0.40	---	0.35	---	5.9	---	2.0	5.6	---
TOTAL	58.7	29.20	22.80	13.40	11.00	10.32	18.29	78.84	214.1	119.6	74.3	100.3
MEAN	1.89	0.97	0.74	0.43	0.39	0.33	0.61	2.54	7.14	3.86	2.40	3.34
AC-FT	116	58	45	27	22	20	36	156	425	237	147	199
MAX	2.8	1.4	0.75	0.55	0.40	0.35	0.85	11	11	6.5	6.5	4.8
MIN	1.4	0.65	0.60	0.40	0.35	0.24	0.34	0.64	4.9	2.0	1.0	1.5

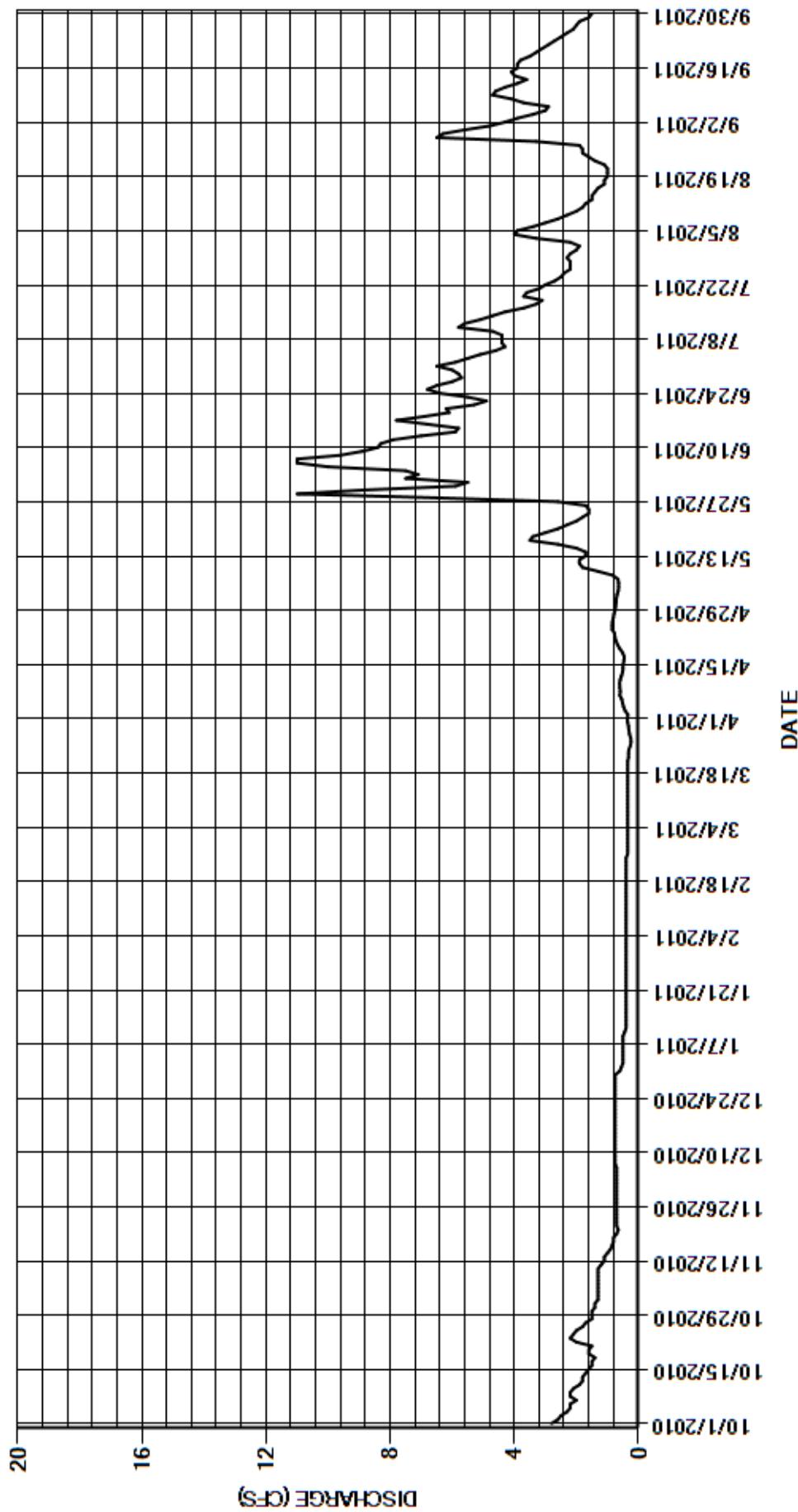
CAL YR	2010	TOTAL	1172.34	MEAN	3.21	MAX	29	MIN	0.47	AC-FT	2330
WTR YR	2011	TOTAL	750.85	MEAN	2.06	MAX	11	MIN	0.24	AC-FT	1490

MAX DISCH: 13.8 CFS AT 00:15 ON MAY 29,2011 GH 3.11 FT SHIFT 0 FT

MAX GH: 3.11 FT AT 00:15 ON MAY 29,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

WILLOW CREEK NEAR CRESTONE
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
SPANISH CREEK NEAR CRESTONE
Water Year 2011

Location.--	Lat 37°57'10", long 105°39'42" referenced to North American Datum of 1983 (Crestone, CO quad, scale 1:24,000), UTM Zone 13 441870 E and 4200782 N, in SE ¼ SE ¼ sec. 9, T.1 N., R.1 E., Luis Maria Baca No. 4 Survey, Saguache County, CO, Hydrologic Unit 13010003, on left bank 3.5 mi southeast of Crestone, CO.
Drainage Area and Period of Record.--	2.4 mi ² . 1999 to current year.
Equipment.--	Data collection platform (Sutron SatLink2), and a float-operated SDR in a 2-ft culvert pipe well and small steel box shelter. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No change.
Hydrologic Conditions.--	Station is located in upper foot hills of a mountain creek above housing development green belt area.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and SDR log as backup. Record is complete and reliable except for Nov. 15-29, 2010 when float was affected by ice in well and Nov. 30, 2010 through Mar. 22, 2011 when the station was closed for the winter. The stage-discharge relation was affected by ice on the control Oct. 26, Nov. 9-14, 2010.
Datum Corrections.--	Levels were run to the reference point in the shelter on Jul. 12, 2011 using B.M. 1 as base. The RP elevation was within allowable limits, so no corrections were required or made. Two peg tests were run on the instrument on May 27, 2011 and July 28, 2011 and no corrections were needed.
Rating.--	The control is a rock weir approximately 3 feet below the gage. This site is flashy, therefore peak flow measurements are difficult to obtain. High flow measurements since 2002 have all been less than 11.9 cfs. The highest measurement in the record, 18.1 cfs was measured on 5/20/2001. Sometime after this measurement occurred the gage pool shifted, but rating 4 did not reflect this shifting. Rating 5 was developed using measurements from WY2010 only because of the damage occurring in 2009, and was used from the beginning of the WY until Mar 22, 2011. Rating 6 was modified from Rating 5 to better reflect the WY2011 measurements, and was used from Mar 22, 2011 through the end of the WY. Flows greater than 10 cfs are considered poor due to the lack of measurements to define this portion of the rating. Fifteen measurements (Nos. 183-197) were made this year ranging in discharge from 0.33 to 5.35 cfs. They cover the discharge range experienced except for higher daily flows on May 28-30, Jun. 1-9, 2011. The peak flow of 15.9 cfs occurred at 2200 on Jun. 01, 2011 at a gage height of 3.57 ft with a shift of 0.00 ft. It exceeded high measurement No. 192, made Jun. 3, 2011 (GH=3.32 ft) by 0.25 ft in stage.
Discharge.--	Shifting control method was used during all open water periods. Shifts were applied as defined by measurements and distributed by time. Measurement shifts ranged from -0.02 to +0.03 ft. All were given full weight except Nos. 191, 193, and 196 which were adjusted as much as 7% to smooth shift distribution. There were two cleaning corrections, -0.01 ft and -0.02 ft, which were prorated by time from previous visits. The stage-discharge relationship was affected by ice and discharge was estimated Oct. 26, Nov. 9-14, 2010.
Special Computations.--	Discharge for periods of no gage-height and ice affected record was estimated using discharge measurements and weather records from Medano Creek at Great Sand Dunes National Park (MEDSANCO).
Remarks.--	Record is fair except for periods of no gage-height and ice affected record and flows over 10 cfs, which are poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	The control at this site is somewhat unstable and is subject to tampering from visitors. It could use some permanent repairs and upgrades.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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SPANISH CREEK NEAR CRESTONE

RATING TABLE-- SPACRECO05 USED FROM 01-OCT-2010 TO 22-MAR-2011
SPACRECO06 USED FROM 22-MAR-2011 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.4	1.1	e0.70	e0.40	e0.50	e0.70	0.51	0.49	8.0	2.3	0.79	2.3
2	1.3	1.0	e0.80	e0.50	e0.50	e0.80	0.62	0.44	8.8	2.1	0.94	2.1
3	1.3	1.0	e1.0	e0.60	e0.50	e0.80	0.72	0.46	7.5	1.9	1.6	1.8
4	1.2	1.1	e0.80	e0.60	e0.60	e0.60	0.63	0.47	8.0	1.7	1.7	1.6
5	1.2	1.0	e0.80	e0.60	e0.50	e0.50	0.58	0.54	9.4	1.6	1.5	1.5
6	1.2	1.0	e0.70	e0.70	e0.50	e0.40	0.65	0.68	9.1	1.5	1.3	1.5
7	1.1	1.0	e0.60	e0.80	e0.50	e0.40	0.64	0.90	7.3	1.4	1.1	2.1
8	1.2	1.0	e0.60	e0.70	e0.40	e0.40	0.60	1.7	6.2	1.4	1.0	2.3
9	1.2	e0.90	e0.70	e0.70	e0.40	e0.50	0.58	2.0	5.5	1.3	0.93	2.5
10	1.2	e0.75	e0.80	e0.50	e0.40	e0.60	0.54	1.6	5.2	1.5	0.85	2.3
11	1.2	e0.70	e0.60	e0.40	e0.50	e0.70	0.49	1.4	4.7	1.7	0.83	2.1
12	1.1	e0.70	e0.60	e0.50	e0.60	e0.70	0.52	1.1	4.4	1.8	0.80	2.0
13	1.1	e0.60	e0.60	e0.60	e0.70	e0.60	0.51	0.99	3.6	1.8	0.75	1.8
14	1.1	e0.60	e0.80	e0.80	e0.90	e0.60	0.53	1.4	3.3	1.6	0.76	1.9
15	1.0	e0.50	e0.80	e0.80	e0.90	e0.60	0.50	1.6	3.6	1.4	0.70	2.1
16	0.99	e0.50	e0.70	e0.80	e0.90	e0.70	0.53	2.6	3.9	1.3	0.65	2.0
17	0.99	e0.60	e0.70	e0.90	e0.80	e0.80	0.64	3.0	3.7	1.2	0.62	2.2
18	1.0	e0.70	e0.70	e0.80	e0.80	e0.70	0.91	2.3	3.0	1.1	0.59	2.1
19	1.1	e0.80	e0.90	e0.70	e0.90	e0.60	0.98	1.9	2.7	1.1	0.58	2.1
20	1.1	e1.0	e1.3	e0.60	e0.70	e0.60	0.85	1.6	2.7	1.1	0.61	2.1
21	1.0	e0.80	e1.1	e0.70	e0.50	e0.60	0.72	1.4	2.6	1.0	0.62	2.0
22	1.1	e0.70	e1.2	e0.70	e0.50	e0.40	0.68	1.3	2.8	0.98	0.64	1.8
23	1.1	e0.70	e1.0	e0.60	e0.50	0.43	0.64	1.3	2.9	0.91	0.73	1.7
24	1.1	e0.60	e0.80	e0.60	e0.60	0.43	0.65	1.4	3.0	0.93	0.68	1.6
25	1.1	e0.50	e0.70	e0.50	e0.60	0.42	0.64	1.3	2.8	0.90	0.74	1.5
26	e1.0	e0.60	e0.60	e0.50	e0.60	0.40	0.59	1.9	2.6	0.87	0.79	1.4
27	1.0	e0.80	e0.60	e0.50	e0.70	0.40	0.55	3.2	2.4	0.88	1.3	1.3
28	1.0	e0.70	e0.60	e0.60	e0.70	0.41	0.51	7.1	2.2	0.83	3.7	1.3
29	1.1	e0.60	e0.70	e0.70	---	0.40	0.53	9.7	2.2	0.89	4.6	1.2
30	1.1	e0.50	e0.60	e0.70	---	0.40	0.48	7.3	2.2	0.83	3.3	1.2
31	1.1	---	e0.50	e0.60	---	0.43	---	4.8	---	0.83	2.6	---
TOTAL	34.68	23.05	23.60	19.70	17.20	17.02	18.52	67.87	136.3	40.65	38.30	55.4
MEAN	1.12	0.77	0.76	0.64	0.61	0.55	0.62	2.19	4.54	1.31	1.24	1.85
AC-FT	69	46	47	39	34	34	37	135	270	81	76	110
MAX	1.4	1.1	1.3	0.90	0.90	0.80	0.98	9.7	9.4	2.3	4.6	2.5
MIN	0.99	0.50	0.50	0.40	0.40	0.40	0.48	0.44	2.2	0.83	0.58	1.2

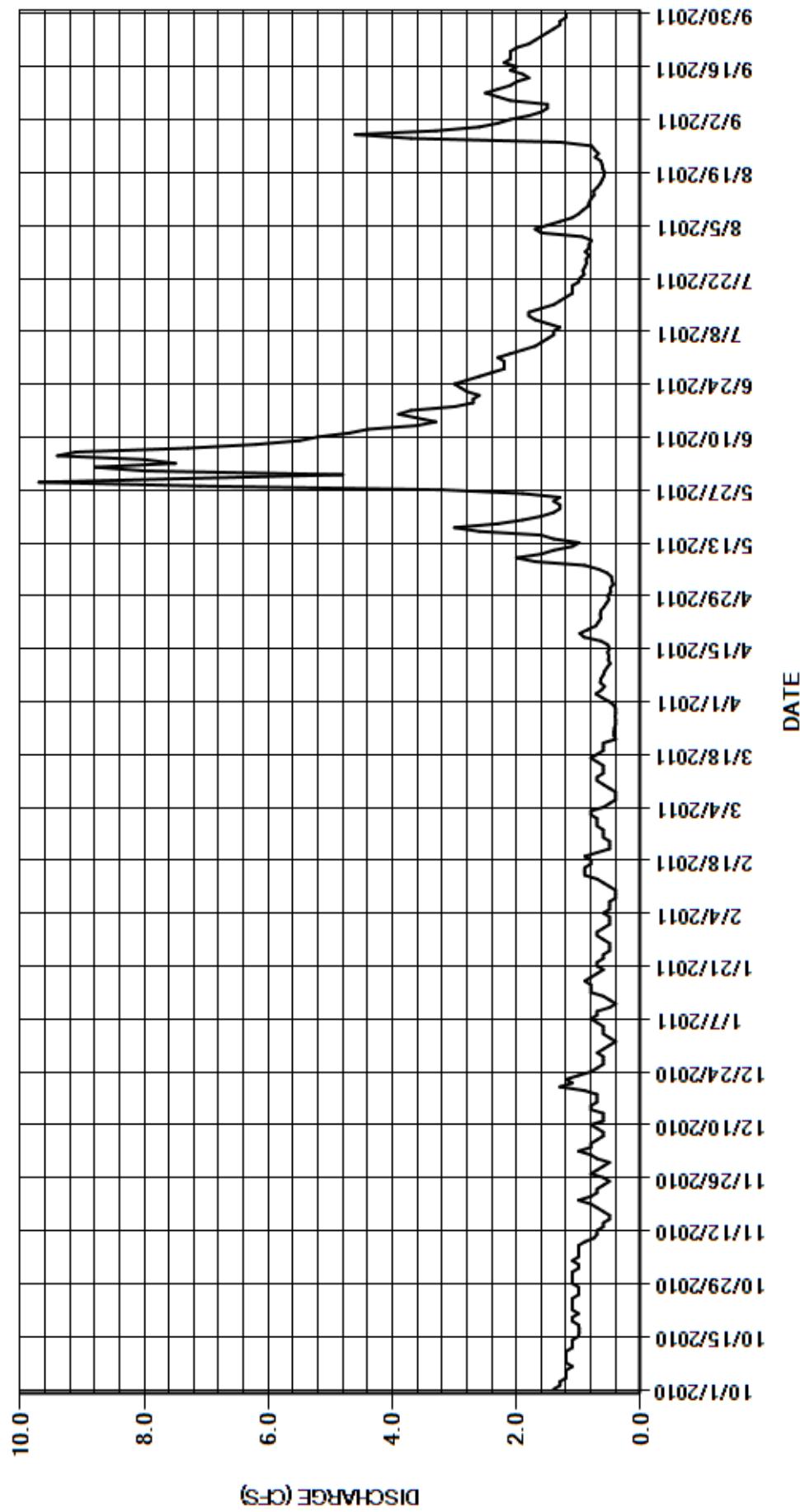
CAL YR	2010	TOTAL	725.29	MEAN	1.99	MAX	22	MIN	0.40	AC-FT	1440
WTR YR	2011	TOTAL	492.29	MEAN	1.35	MAX	9.7	MIN	0.40	AC-FT	976

MAX DISCH: 15.9 CFS AT 22:00 ON JUN 01,2011 GH 3.57 FT SHIFT 0 FT

MAX GH: 3.57 FT AT 22:00 ON JUN 01,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SPANISH CREEK NEAR CRESTONE
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08229500 COTTONWOOD CREEK NEAR CRESTONE
Water Year 2011

Location.--	Lat 37°55'60", long 105°38'44" referenced to North American Datum of 1983 (Crestone, CO quad, scale 1:24,000), UTM Zone 13 443270 E and 4198611 N, in NE ¼ NE ¼ sec. 22, T.1 N., R.1 E., Luis Maria Baca No. 4 Survey, Saguache County, CO, Hydrologic Unit 13010003, on left bank 5 mi southeast of Crestone, CO.
Drainage Area and Period of Record.--	5.0 mi ² . May 1936 - Nov. 30, 1936, 1967 - 1970, October 1998 to current year.
Equipment.--	Data collection platform (Sutron Satlink2) and a float-operated SDR in a 3 ft. by 3 ft. timber shelter and well. The primary reference gage is a drop tape from reference point on shelf. Outside cantilever staff gage installed April 28, 2011.
Hydrologic Conditions.--	Steep undeveloped alpine and sub-alpine drainage. One minor diversion above gage for domestic use.
Gage-Height Record.--	Primary record is 15-minute DCP transmitted data with DCP log and SDR log as backup. Gage-height record is complete and reliable except for Oct. 12-14, 2010 when inlets were buried; Nov. 13-29, 2010 when the well was frozen; and Nov. 30, 2010 through Mar. 22, 2011 when station was closed for the winter. There were three instrument corrections made to the SDR ranging from -0.01 to +0.01 ft, which were prorated by time from the previous visit. There were two flush corrections made, which were prorated from previous point of inflection.
Datum Corrections.--	Levels were run July 12, 2011 to the Reference Point (RP) inside the gage using BM #3 as base. The RP was within allowable limits, and no correction was made. Two-peg tests were performed on May 27, 2011 and July 28, 2011 and the instrument was within allowable limits so no correction was made.
Rating.--	The control is a cobble riffle approximately 6 feet below the gage. Shifting occurs mainly due to the movement of streambed materials and leaves building up on the control. Rating No. 5-1 was used again this water year. It is fairly well defined from 0.7 to 50 cfs. Fifteen discharge measurements (Nos. 184-198) were made during the year ranging from 0.73 to 15.2 cfs. They cover the discharge range experienced except for lower daily flows on Jan. 11-13, 21-25, Feb. 1-3, 6-14, 23-25, Mar. 6-13, 16, 23-27, 29-30, 2011 and higher daily flows on May 28-30, and Jun. 1-10, 2011. The peak flow of 42 cfs occurred at 1830 on May 28, 2011 at a gage height of 2.63 ft and shift of 0.00 ft. It exceeded high measurement No. 193 (GH = 2.23), made June 3, 2011, by 0.40 ft in stage.
Discharge.--	Shifting control method was used during all open water periods. A variable shift curve VS1102 was used From May 9 to Aug. 25, 2011. During other periods, shifts were applied as defined by measurements and distributed by time and events. Measurement shifts ranged from -0.07 to +0.02 feet. All measurements were given full weight except Nos. 193 and 195 which were rated fair and adjusted by as much as 4% to smooth shift distribution. The high measurement was adjusted back to the rating due to the higher measurements made the previous year.
Special Computations.--	Discharge for periods of no gage-height and unreliable gage-height were estimated using discharge measurements and weather records from Medano Creek at Great Sand Dunes National Park (MEDSANCO).
Remarks.--	Record is fair, except for periods of no gage height or unreliable gage height, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff .
Recommendations.--	Consider moving gage back to the Parshall flume downstream to reduce flush corrections, cleaning corrections, and control changes.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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08229500 COTTONWOOD CREEK NEAR CRESTONE

RATING TABLE-- COCRESCO05-1 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

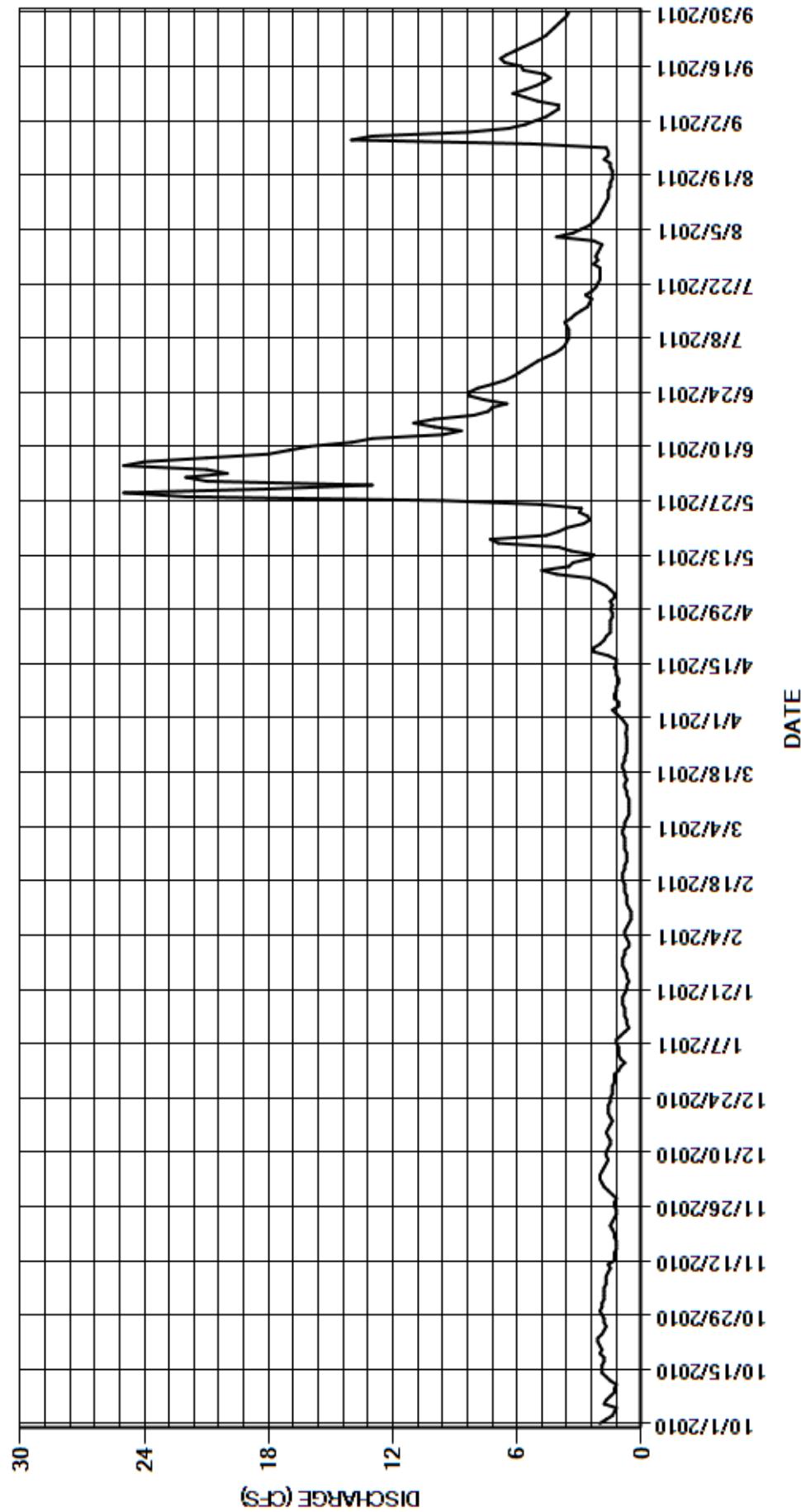
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.0	1.9	e1.8	e1.0	e0.60	e0.80	0.99	1.5	21	5.3	1.9	5.6
2	1.7	1.8	e1.9	e0.80	e0.60	e0.90	1.2	1.3	22	5.0	2.3	5.1
3	1.4	1.8	e2.0	e1.0	e0.70	e0.90	1.4	1.3	20	4.6	4.1	4.6
4	1.3	1.8	e2.0	e1.1	e0.80	e0.80	1.1	1.5	21	4.2	3.3	4.3
5	1.2	1.8	e1.9	e1.1	e0.80	e0.80	1.1	1.7	25	3.9	2.9	4.0
6	1.8	1.7	e1.8	e1.1	e0.70	e0.70	1.3	2.1	24	3.7	2.5	4.0
7	1.7	1.7	e1.7	e1.2	e0.60	e0.60	1.3	2.5	21	3.6	2.3	5.0
8	1.5	1.7	e1.6	e1.2	e0.50	e0.60	1.2	4.1	18	3.5	2.1	5.6
9	1.3	1.6	e1.7	e1.0	e0.50	e0.60	1.2	4.8	17	3.5	2.0	6.2
10	1.3	1.5	e1.7	e0.80	e0.50	e0.60	1.1	3.5	16	3.5	1.9	5.6
11	1.2	1.6	e1.6	e0.60	e0.60	e0.60	1.1	3.3	14	3.6	1.8	5.1
12	e1.5	1.3	e1.5	e0.70	e0.70	e0.70	1.2	2.5	13	3.7	1.7	4.7
13	e1.7	e1.3	e1.5	e0.70	e0.70	e0.70	1.2	2.3	9.6	3.4	1.6	4.4
14	e1.9	e1.3	e1.6	e0.80	e0.70	e0.80	1.3	3.4	8.7	3.2	1.6	4.7
15	1.9	e1.2	e1.7	e0.80	e0.80	e0.80	1.2	4.0	10	2.9	1.6	5.7
16	1.9	e1.2	e1.6	e0.80	e0.80	e0.70	1.2	6.9	11	2.6	1.5	5.8
17	1.8	e1.2	e1.5	e0.90	e0.80	e0.80	1.6	7.3	10	2.5	1.5	6.6
18	1.8	e1.3	e1.4	e0.90	e0.90	e0.80	2.3	4.6	8.1	2.4	1.4	6.8
19	2.0	e1.3	e1.5	e0.90	e0.90	e0.90	2.3	4.0	7.4	2.7	1.4	6.5
20	1.9	e1.4	e1.6	e0.80	e0.90	e0.90	2.0	3.6	7.2	2.4	1.4	6.1
21	2.0	e1.5	e1.6	e0.70	e0.80	e0.80	1.8	2.8	6.5	2.2	1.5	5.7
22	2.1	e1.4	e1.6	e0.70	e0.80	e0.80	1.7	2.5	7.6	2.1	1.5	5.3
23	2.1	e1.3	e1.5	e0.60	e0.70	0.72	1.5	2.6	8.3	2.0	1.8	4.9
24	1.9	e1.2	e1.5	e0.70	e0.70	0.71	1.5	3.0	8.3	2.0	1.6	4.6
25	1.8	e1.2	e1.4	e0.70	e0.70	0.70	1.5	2.9	7.9	2.0	1.6	4.4
26	1.7	e1.3	e1.4	e0.80	e0.80	0.70	1.5	4.9	7.2	2.0	1.7	4.2
27	1.8	e1.3	e1.4	e0.90	e0.80	0.72	1.4	9.6	6.6	2.3	5.3	4.0
28	1.8	e1.2	e1.3	e0.90	e0.80	0.75	1.4	22	6.2	2.1	14	3.8
29	1.9	e1.4	e1.3	e0.90	---	0.71	1.5	25	5.9	2.2	13	3.6
30	2.0	e1.6	e1.3	e0.80	---	0.70	1.4	18	5.6	2.1	8.4	3.5
31	1.9	---	e1.1	e0.80	---	0.84	---	13	---	2.0	6.4	---
TOTAL	53.8	43.8	49.0	26.70	20.20	23.15	42.49	172.5	374.1	93.2	97.6	150.4
MEAN	1.74	1.46	1.58	0.86	0.72	0.75	1.42	5.56	12.5	3.01	3.15	5.01
AC-FT	107	87	97	53	40	46	84	342	742	185	194	298
MAX	2.1	1.9	2.0	1.2	0.90	0.90	2.3	25	25	5.3	14	6.8
MIN	1.2	1.2	1.1	0.60	0.50	0.60	0.99	1.3	5.6	2.0	1.4	3.5
CAL YR	2010	TOTAL	1663.60	MEAN	4.56	MAX	51	MIN	0.70	AC-FT	3300	
WTR YR	2011	TOTAL	1146.94	MEAN	3.14	MAX	25	MIN	0.50	AC-FT	2270	

MAX DISCH: 42 CFS AT 18:30 ON MAY 28,2011 GH 2.63 FT SHIFT 0 FT

MAX GH: 2.63 FT AT 18:30 ON MAY 28,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08229500 COTTONWOOD CREEK NEAR CRESTONE
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
DEADMAN CREEK AT MOUTH OF CANYON NEAR CRESTONE, CO
Water Year 2011

Location.--	Lat 37°53'41", long 105°37'25" referenced to North American Datum of 1983 (Crestone Peak, CO quad, scale 1:24,000), UTM Zone 13 445160 E and 4194332 N, in SW ¼ SW ¼ sec. 36, T.1 N., R.1 E., Baca Survey, Saguache County, CO, Hydrologic Unit 13010003, on right bank 8.2 mi southeast of Crestone, CO and 21.4 mi northeast of Mosca, CO.
Drainage Area and Period of Record.--	9.6 mi ² , from 10m DEM in Colorado StreamStats. May 1936 - November 1936, April 2011 to September 2011.
Equipment.--	Sutron Constant Flow Bubbler with Sutron Satlink2 DCP in NEMA enclosure at log cross-vane control structure. The primary reference gage is a cantilever wire weight gage.
Hydrologic Conditions.--	Undeveloped steep alpine and subalpine terrain.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log as backup. Record is complete and reliable from Apr. 18, 2011 at 1345 when record started. Apr. 1 to 18, 2011 were estimated. Instrument corrections were applied as noted; when no correction was made the correction was held or prorated to the correction observed on the next visit. The corrections at 14:40 and 17:00 on May 16, 2011 were opposing so it was assumed that the gage was set wrong at 14:40 and the record was corrected between the two observations. Instrument correction distributions ranged from -0.01 ft to +0.05 ft.
Datum Corrections.--	Levels were run Apr. 18, 2011 to establish benchmarks. From instrument correction and shift pairs it appears the primary reference gage settled approximately 0.10 ft and levels will be needed in WY2012. Two-peg tests were performed on the instrument on August 26, 2010 and May 27, 2011, and no adjustments were made.
Rating.--	The control is a log cross-vane structure that was installed the week of April 11, 2011. This structure is expected to be stable with shifting resulting from fill and scour of the material in the gage pool. The log cross-vane structure is not highly sensitive to low flows, but was done this way to help reduce the potential for control failure. Rating DEDMOUCO02-1 was developed from streamflow measurements 1 to 12, but measurements 1 and 2 were given less weight because the reference gage settled approximately 0.10 ft. A survey of the control cross-section from July 11, 2011 was evaluated to identify breakpoints in the rating. The peak flow for WY2011 was verified by comparing losses during the peak measurement between DEDCRECO and DEDMOUCO and verifying similar losses between the peak computed flow between the same two sites. DEDMOUCO02-1 is well defined from 1.5 cfs to 43 cfs. Ten measurements (1 to 10) were made this year, ranging in discharge from 2.00 to 28.6 cfs. The measurements cover the discharge range experienced except for higher daily flows May 28, 29, Jun. 2, 2011 and lower daily flows Apr. 1-15 (estimated), Apr. 28 - May 4, and Aug. 9 - 26, 2011. The peak flow of 54.2 cfs occurred at 2145 on May 28, 2011 at a gage height of 2.20 ft with a 0.00 ft shift. It exceeded high measurement No. 4 (gh = 1.93 ft) by 0.27 ft in stage.
Discharge.--	Shifting control method was used for all open water periods. Shifts were applied as defined by discharge measurements and distributed by time. Shifting from Apr. 18, 2011 to May 16, 2011 is attributed to gage settling. Measurement shifts ranged from -0.03 to +0.09 ft. All were given full weight except Nos. 3-5, 7, which were adjusted as much as 8% to smooth the shift distribution. High flow measurement 4 was adjusted 3% back to the rating which was drawn to best fit all the measurements. One cleaning correction was identified Jun. 23 and was prorated as a shift from the previous visit.
Special Computations.--	Apr. 1-18, 2011 was estimated based on hydrographic comparison with downstream gage: Deadman Creek near Crestone (DEDCRECO) and estimated losses between the two sites and air temperature data from MEDSANCO. Since the primary reference gage is a cantilever wire weight gage, the constant flow bubbler can only be set accurately to plus or minus 0.02 ft at lower stages and more error at higher stages depending on gage pool conditions.
Remarks.--	Record is fair except for estimated record, which is poor. This is a new gage with records starting 1345 April 18, 2011 and no prior data in WY10 or WY11. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	Run levels.

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DEADMAN CREEK AT MOUTH OF CANYON NEAR CRESTONE, CO

RATING TABLE-- DEDMOUCO02-1 USED FROM 18-APR-2011 TO 30-SEP-2011

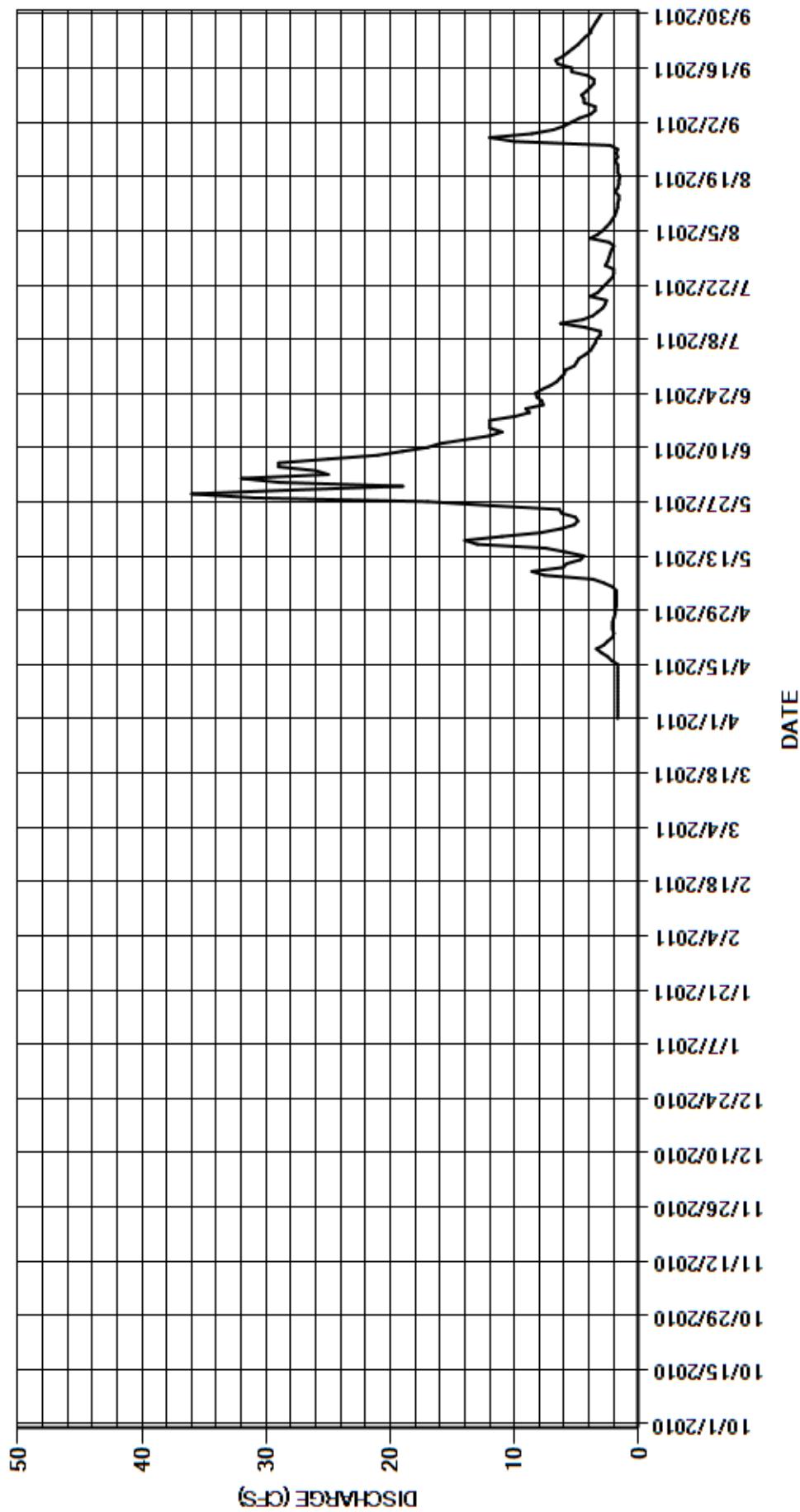
DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011												
DAY	MEAN VALUES											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	e1.7	1.8	29	5.2	2.0	6.0
2	---	---	---	---	---	---	e1.7	1.8	32	5.0	2.4	5.4
3	---	---	---	---	---	---	e1.7	1.8	25	4.8	3.9	4.8
4	---	---	---	---	---	---	e1.7	1.8	26	4.3	3.3	3.9
5	---	---	---	---	---	---	e1.7	2.1	29	3.9	2.9	3.5
6	---	---	---	---	---	---	e1.7	2.8	29	3.7	2.6	3.5
7	---	---	---	---	---	---	e1.7	3.7	25	3.5	2.3	4.4
8	---	---	---	---	---	---	e1.7	7.6	21	3.4	2.1	4.4
9	---	---	---	---	---	---	e1.7	8.6	19	3.1	1.9	4.6
10	---	---	---	---	---	---	e1.7	6.1	17	3.1	1.8	4.2
11	---	---	---	---	---	---	e1.7	5.8	16	4.3	1.7	3.9
12	---	---	---	---	---	---	e1.7	4.7	14	6.3	1.7	3.6
13	---	---	---	---	---	---	e1.7	4.4	12	4.5	1.6	3.6
14	---	---	---	---	---	---	e1.7	5.9	11	3.7	1.6	4.1
15	---	---	---	---	---	---	e1.7	7.5	12	3.3	1.9	5.4
16	---	---	---	---	---	---	e2.2	13	12	2.9	1.7	5.4
17	---	---	---	---	---	---	e2.5	14	12	2.7	1.6	6.5
18	---	---	---	---	---	---	e3.0	11	10	2.6	1.6	6.7
19	---	---	---	---	---	---	3.4	7.9	8.8	3.9	1.5	6.1
20	---	---	---	---	---	---	2.8	6.3	9.1	3.3	1.7	5.7
21	---	---	---	---	---	---	2.5	5.2	7.7	3.0	1.7	5.3
22	---	---	---	---	---	---	2.1	4.9	7.8	2.7	1.7	4.9
23	---	---	---	---	---	---	2.0	5.1	8.2	2.4	1.9	4.6
24	---	---	---	---	---	---	2.1	6.2	8.3	2.1	1.7	4.3
25	---	---	---	---	---	---	2.1	6.4	7.8	2.0	1.8	3.9
26	---	---	---	---	---	---	2.1	12	7.1	2.0	1.7	3.8
27	---	---	---	---	---	---	2.0	17	6.6	2.7	2.3	3.6
28	---	---	---	---	---	---	1.9	31	6.3	2.5	10	3.4
29	---	---	---	---	---	---	1.9	36	6.0	2.4	12	3.2
30	---	---	---	---	---	---	1.8	28	5.9	2.3	8.6	3.0
31	---	---	---	---	---	---	---	19	---	2.2	6.9	---
TOTAL	---	---	---	---	---	---	59.9	289.4	440.6	103.8	92.1	135.7
MEAN	---	---	---	---	---	---	2.00	9.34	14.7	3.35	2.97	4.52
AC-FT	---	---	---	---	---	---	119	574	874	206	183	269
MAX	---	---	---	---	---	---	3.4	36	32	6.3	12	6.7
MIN	---	---	---	---	---	---	1.7	1.8	5.9	2.0	1.5	3.0
CAL YR	2010	TOTAL	1121.5	MEAN	6.13	MAX	36	MIN	1.5	AC-FT	2220	
WTR YR	2011	TOTAL				MAX		MIN		AC-FT		

MAX DISCH: 54.2 CFS AT 21:45 ON MAY 28,2011 GH 2.20 FT SHIFT 0 FT

MAX GH: 2.20 FT AT 21:45 ON MAY 28,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

DEADMAN CREEK AT MOUTH OF CANYON NEAR CRESTONE, CO
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
DEADMAN CREEK NEAR CRESTONE
Water Year 2011

Location.--	Lat 37°53'5", long 105°38'47" referenced to North American Datum of 1983 (Crestone, CO quad, scale 1:24,000), UTM Zone 13 443160 E and 4193222 N, in NE ¼ SE ¼ sec. 3, T.1 S., R.1 E., Baca Survey, Saguache County, CO, Hydrologic Unit 13010003, on left bank 8 mi southeast of Crestone, CO and 20.5 mi northeast of Mosca, CO.
Drainage Area and Period of Record.--	8.4 mi ² . May 1936 - November 1936, and October 1998 to current year. 1936 record not equivalent.
Equipment.--	Data collection platform (Sutron Satlink2) and a float-operated SDR in a 2-foot steel culvert pipe stilling well with a small steel box-type shelter atop well until April 18, 2011 when DCP was removed leaving the SDR to log the water-stage. The well is connected to a non-standard 6-foot Parshall Flume in fair condition. Gage-height set from outside staff gage in the non-standard 6-foot Parshall Flume.
Hydrologic Conditions.--	Predominantly undeveloped steep alpine and sub-alpine terrain with extensive losses as stream traverses sandy valley margins.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP and SDR logs as backup until April 18, 2011 when Satlink was removed. Since April 18, 2011 primary record is 15-minute data from SDR log. Record is complete and reliable, except for Oct. 1 - 21, Oct. 26 - Nov. 29, Mar. 25 - Apr. 17, Apr. 23-24, Apr. 26 - May 5, Jul. 18, Jul. 21 - Aug. 2, and Aug. 5 - 27 when all or part of the day the gage was isolated from the flume and Nov. 30 - Mar. 24 when station was closed. Two unit values were estimated from adjacent good record and on-site observations on April 18, 2011 without loss of accuracy. Gage isolates at approximately 0.07 ft.
Datum Corrections.--	A formal inspection with levels was not performed this year. The Parshall flume was last inspected and levels were shot on Aug. 5, 2008.
Rating.--	Rating No. 1, a standard six foot Parshall flume rating, was used all year. Minor shifting occurs due to non-standard flume dimensions, approach velocity, and approach angle. Twelve discharge measurements, 7 measurements greater than 0 cfs, (Nos. 57-68) were made during the water year because of limited access to the station. The measured discharges ranged from 0 to 14.5 cfs. The measurements cover the discharge range experienced except for higher daily flows on May 28-30 and Jun. 1-8. The peak flow of 33.4 cfs occurred at 2200 on May 28, 2011 at a gage height of 1.24 feet with a shift of -0.01 feet. It exceeded high measurement No. 63 (GH = 0.74), made June 3, 2011, by 0.50 feet in stage.
Discharge.--	Shifting-control method was used for all periods of good record. Shifts were applied as defined by measurements and distributed by time. Measurement shifts ranged from -0.02 to +0.00 feet. All were given full weight and applied except for No. 62, which was adjusted 6% to smooth shift distribution. There was no flow Oct. 1-18, Nov. 1-17, Nov. 19 - Dec. 19, Dec. 22 - Jan. 12, Jan. 14 - Feb. 12, Feb. 16 - Feb. 22, Feb. 24 - Mar. 9, Mar. 22 - Apr. 17, May 3, 4, Jul. 30 - Aug. 2, and Aug. 27 (177 days).
Special Computations.--	Discharge for periods of no gage-height was estimated using site observations, temperature record from SANDUNCO, precipitation from UTEFTGCO, and hydrographic comparison with Deadman Creek at Mouth of Canyon.
Remarks.--	Record is fair, except for periods of no gage-height, including periods when the well was isolated, and flows below 2.6 cfs, which are poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	Inlets should be reworked to lower the point of isolation and inside reference point and drop tape should be established.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

DEADMAN CREEK NEAR CRESTONE

RATING TABLE-- DEDCRECO01 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e0.00	e0.35	18	3.0	e0.00	2.0						
2	e0.00	e0.36	22	2.5	e0.00	1.7						
3	e0.00	19	2.2	0.88	1.3							
4	e0.00	19	1.8	0.66	1.1							
5	e0.00	e0.44	22	1.5	e0.50	0.84						
6	e0.00	1.1	21	1.3	e0.23	0.72						
7	e0.00	1.5	19	1.2	e0.27	1.3						
8	e0.00	4.1	16	0.99	e0.22	1.3						
9	e0.00	4.9	14	0.85	e0.20	1.5						
10	e0.00	e0.00	e0.00	e0.00	e0.00	e0.10	e0.00	3.5	13	0.77	e0.20	1.3
11	e0.00	e0.00	e0.00	e0.00	e0.00	e0.10	e0.00	3.5	12	1.3	e0.20	1.1
12	e0.00	e0.00	e0.00	e0.00	e0.00	e0.10	e0.00	3.0	11	3.3	e0.15	0.89
13	e0.00	e0.00	e0.00	e0.20	e0.20	e0.10	e0.00	2.5	8.6	2.1	e0.14	0.83
14	e0.00	e0.00	e0.00	e0.00	e0.20	e0.10	e0.00	3.7	7.7	1.4	e0.14	1.2
15	e0.00	e0.00	e0.00	e0.00	e0.20	e0.10	e0.00	4.4	8.3	1.0	e0.14	2.1
16	e0.00	e0.00	e0.00	e0.00	e0.00	e0.10	e0.00	8.4	8.6	0.67	e0.14	2.1
17	e0.00	e0.00	e0.00	e0.00	e0.00	e0.10	e0.00	8.9	8.3	0.49	e0.11	2.7
18	e0.00	e0.12	e0.00	e0.00	e0.00	e0.10	0.69	6.5	7.1	e0.36	e0.09	2.9
19	e0.26	e0.00	e0.00	e0.00	e0.00	e0.10	1.0	5.0	6.4	1.1	e0.09	2.6
20	e0.26	e0.00	e0.20	e0.00	e0.00	e0.10	0.66	4.0	6.5	0.73	e0.09	2.3
21	e0.24	e0.00	e0.20	e0.00	e0.00	e0.10	0.45	3.3	5.6	e0.46	e0.07	2.1
22	0.41	e0.00	e0.00	e0.00	e0.00	e0.00	0.36	3.0	5.5	e0.30	e0.05	1.8
23	0.45	e0.00	e0.00	e0.00	e0.20	e0.00	e0.29	3.1	5.5	e0.20	e0.05	1.6
24	0.35	e0.00	e0.00	e0.00	e0.00	e0.00	e0.35	3.7	5.3	e0.00	e0.04	1.4
25	0.34	e0.00	e0.00	e0.00	e0.00	e0.00	0.42	3.6	5.0	e0.00	e0.02	1.2
26	e0.29	e0.00	e0.00	e0.00	e0.00	e0.00	e0.32	6.6	4.5	e0.00	e0.02	1.0
27	e0.24	e0.00	e0.00	e0.00	e0.00	e0.00	e0.25	9.7	4.0	e0.30	e0.00	0.85
28	e0.21	e0.00	e0.00	e0.00	e0.00	e0.00	e0.00	18	3.7	e0.25	1.9	0.74
29	e0.20	e0.00	e0.00	e0.00	---	e0.00	e0.30	25	3.5	e0.15	5.1	0.58
30	e0.25	e0.00	e0.00	e0.00	---	e0.00	e0.20	20	3.4	e0.00	3.2	0.51
31	e0.20	---	e0.00	e0.00	---	e0.00	---	12	---	e0.00	2.4	---
TOTAL	3.70	0.12	0.40	0.20	0.80	1.20	5.29	174.15	313.5	30.22	17.30	43.56
MEAN	0.12	0.004	0.013	0.006	0.029	0.039	0.18	5.62	10.4	0.97	0.56	1.45
AC-FT	7.3	0.2	0.8	0.4	1.6	2.4	10	345	622	60	34	86
MAX	0.45	0.12	0.20	0.20	0.20	0.10	1.0	25	22	3.3	5.1	2.9
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.4	0.00	0.00	0.51

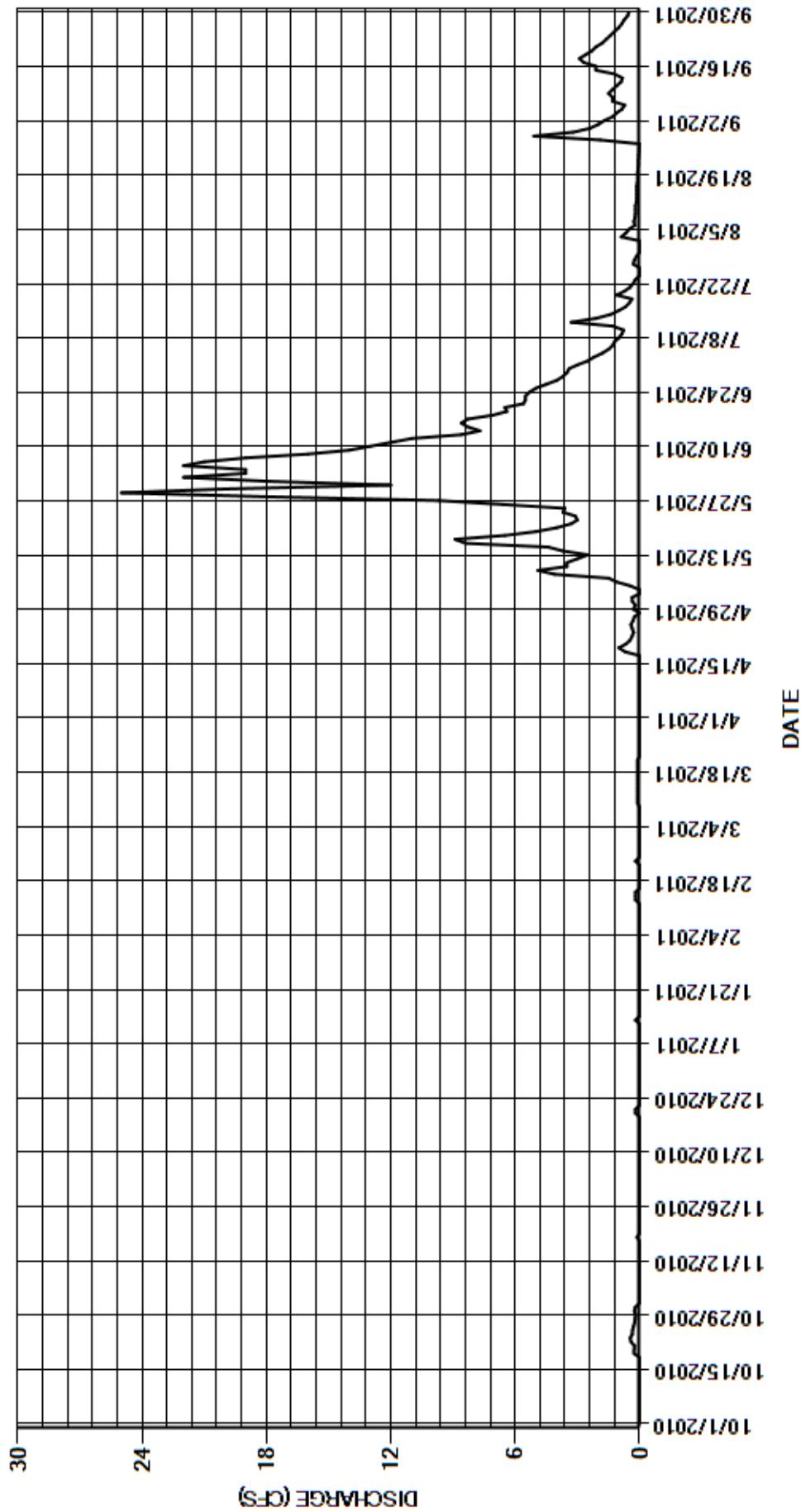
CAL YR	2010	TOTAL	1099.81	MEAN	3.01	MAX	51	MIN	0.00	AC-FT	2180
WTR YR	2011	TOTAL	590.44	MEAN	1.62	MAX	25	MIN	0.00	AC-FT	1170

MAX DISCH: 33.4 CFS AT 22:00 ON MAY 28,2011 GH 1.24 FT SHIFT -0.01 FT

MAX GH: 1.24 FT AT 22:00 ON MAY 28,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

DEADMAN CREEK NEAR CRESTONE
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
LITTLE SPRING CREEK AT MEDANO RANCH NEAR MOSCA, CO
Water Year 2011

Location.-- Lat 37°42'46", long 105°39'1" referenced to North American Datum of 1983 (Medano Ranch, CO quad, scale 1:24,000), UTM Zone 13 442697 E and 4174153 N, in NE ¼ SW ¼ sec. 15, T.40 N., R.12 E., New Mexico Principal Meridian, Alamosa County, CO, Hydrologic Unit 13010003, on left bank 5 mi northeast of San Luis Lakes and 13 mi northeast of Mosca, CO.

Drainage Area and Period of Record.-- 0.2 mi². 2000 to current year.

Equipment.-- Float-operated Sutron SDR with SDI-12 radio bridge in a 30 inch diameter pipe stilling well and CMP extension for gage shelter. The gage-height data is transmitted via radio bridge to data collection platform (Sutron Satlink2) at Big Spring Creek at Medano Ranch near Mosca. The primary reference gage is a staff gage in the 2 foot Parshall flume.

Hydrologic Conditions.-- Flow primarily due to groundwater accretions.

Gage-Height Record.-- Primary record is 15-minute transmitted data with SDR and DCP log as backup. Record is complete and reliable except for Nov. 26 - Dec. 22, Dec. 31, 2010 - Mar. 14, 2011 when the well was frozen. The stage-discharge relation was affected by ice Nov. 23-25, Dec. 30, 2010. The Parshall flume was partially submerged Oct. 9 - Nov. 25, Dec. 23-30, 2010. There were three corrections made to the shaft encoder of -0.01 ft, -0.02 ft, and 0.02 ft on Apr. 5, Jul. 8, and Aug. 18, 2011, respectively, which were prorated by time from the previous visits.

Datum Corrections.-- A formal inspection with levels was not performed this year. The last Parshall flume inspection and levels were completed on Jul. 3, 2008, with an assumed elevation of 0.000 at the flume floor adjacent to the staff gage (REW). Levels indicate that the flume floor slopes approximately 2% with the floor at the staff gage (REW) found to be 0.076 ft lower than the well inlet (LEW). The flume also slopes slightly downward toward diverging section. Inspection included measurement of all pertinent Parshall Flume dimensions.

Rating.-- A standard two-foot Parshall flume rating was used all year. Sand and moss build-up in approach and inside the flume requires occasional cleaning. Fourteen measurements (Nos. 127-140) were made this year ranging in discharge from 1.16 to 1.95 cfs. They cover the discharge range experienced except for lower daily flows on Aug. 8-10, 13, 18, 19, 2011. The peak flow of 3.44 cfs occurred at 1530 on Jul. 11, 2011 at a gage height of 0.56 ft with a shift of 0.02 ft. It exceeded high flow measurement No. 135 (gh = 0.38 ft) by 0.18 ft in stage.

Discharge.-- Shifting control method was used during all periods of gage-height record. Shifts were applied as defined by measurements and distributed by time. Measurement shifts ranged from -0.06 ft. (flume slightly submerged) to +0.02 ft. All were given full weight except for Nos. 135, 136, and 140, which were adjusted by as much as 5% to smooth shift distribution. The stage-discharge relation was affected by ice and discharge estimated Nov. 23-25, Dec. 30, 2010.

Special Computations.-- Discharge for periods of no gage-height and ice affected record was estimated using discharge measurements, hydrographic comparison with nearby station Big Spring Creek at Medano Ranch, and weather records.

Remarks.-- Record is good, except for periods of backwater, which is fair, and periods of no gage height and ice affected record which is estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

LITTLE SPRING CREEK AT MEDANO RANCH NEAR MOSCA, CO

RATING TABLE-- STD02FTP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

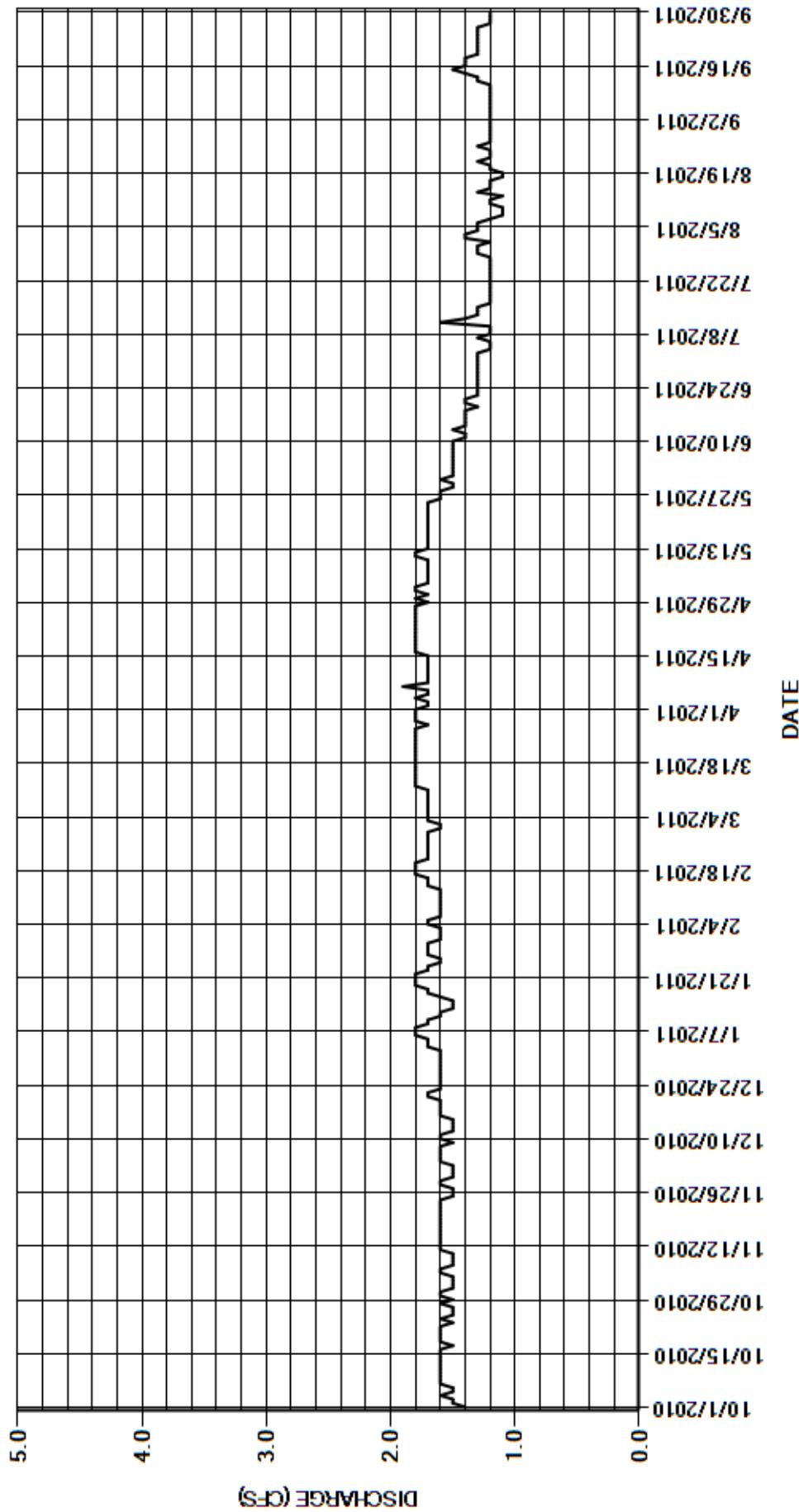
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.4	1.5	e1.5	e1.6	e1.6	e1.6	1.8	1.7	1.5	1.3	1.2	1.2
2	1.5	1.5	e1.5	e1.6	e1.6	e1.6	1.7	1.8	1.5	1.3	1.4	1.2
3	1.5	1.5	e1.5	e1.7	e1.6	e1.7	1.7	1.8	1.5	1.3	1.4	1.2
4	1.6	1.5	e1.6	e1.7	e1.7	e1.7	1.8	1.7	1.5	1.2	1.3	1.2
5	1.5	1.6	e1.6	e1.7	e1.7	e1.7	1.7	1.7	1.5	1.2	1.3	1.2
6	1.5	1.6	e1.6	e1.8	e1.6	e1.7	1.7	1.7	1.5	1.2	1.3	1.2
7	1.6	1.5	e1.6	e1.8	e1.6	e1.7	1.9	1.7	1.5	1.3	1.2	1.2
8	1.6	1.5	e1.6	e1.8	e1.6	e1.7	1.7	1.7	1.5	1.2	1.1	1.2
9	1.6	1.5	e1.5	e1.7	e1.6	e1.7	1.7	1.7	1.5	1.2	1.1	1.2
10	1.6	1.5	e1.6	e1.7	e1.6	e1.7	1.7	1.7	1.5	1.2	1.1	1.2
11	1.6	1.6	e1.6	e1.6	e1.6	e1.7	1.7	1.8	1.4	1.6	1.2	1.2
12	1.6	1.6	e1.5	e1.6	e1.6	e1.8	1.7	1.8	1.4	1.4	1.2	1.3
13	1.6	1.6	e1.5	e1.5	e1.6	e1.8	1.7	1.7	1.5	1.3	1.1	1.3
14	1.6	1.6	e1.5	e1.5	e1.7	e1.8	1.7	1.7	1.4	1.3	1.3	1.4
15	1.6	1.6	e1.5	e1.5	e1.7	1.8	1.7	1.7	1.4	1.3	1.2	1.5
16	1.6	1.6	e1.6	e1.6	e1.7	1.8	1.8	1.7	1.4	1.2	1.2	1.4
17	1.5	1.6	e1.6	e1.7	e1.8	1.8	1.8	1.7	1.4	1.2	1.2	1.4
18	1.6	1.6	e1.6	e1.7	e1.8	1.8	1.8	1.7	1.4	1.2	1.1	1.4
19	1.6	1.6	e1.6	e1.8	e1.8	1.8	1.8	1.7	1.3	1.2	1.1	1.3
20	1.6	1.6	e1.6	e1.8	e1.8	1.8	1.8	1.7	1.4	1.2	1.2	1.3
21	1.6	1.6	e1.7	e1.8	e1.7	1.8	1.8	1.7	1.4	1.2	1.2	1.3
22	1.6	1.6	e1.7	e1.8	e1.7	1.8	1.8	1.7	1.3	1.2	1.3	1.3
23	1.5	e1.6	1.6	e1.7	e1.7	1.8	1.8	1.7	1.3	1.2	1.2	1.3
24	1.6	e1.6	1.6	e1.7	e1.7	1.8	1.8	1.7	1.3	1.2	1.2	1.3
25	1.5	e1.5	1.6	e1.6	e1.7	1.8	1.8	1.7	1.3	1.2	1.2	1.3
26	1.5	e1.5	1.6	e1.6	e1.7	1.8	1.8	1.6	1.3	1.2	1.3	1.3
27	1.5	e1.5	1.6	e1.7	e1.7	1.8	1.8	1.6	1.3	1.2	1.2	1.2
28	1.6	e1.6	1.6	e1.7	e1.7	1.7	1.8	1.6	1.3	1.2	1.2	1.2
29	1.5	e1.6	1.6	e1.7	---	1.8	1.7	1.5	1.3	1.3	1.2	1.2
30	1.6	e1.5	e1.6	e1.7	---	1.8	1.8	1.5	1.3	1.3	1.2	1.2
31	1.6	---	e1.6	e1.6	---	1.8	---	1.6	---	1.3	1.2	---
TOTAL	48.4	46.8	49.0	52.0	46.9	54.4	52.8	52.3	42.1	38.8	37.6	38.1
MEAN	1.56	1.56	1.58	1.68	1.68	1.75	1.76	1.69	1.40	1.25	1.21	1.27
AC-FT	96	93	97	103	93	108	105	104	84	77	75	76
MAX	1.6	1.6	1.7	1.8	1.8	1.8	1.9	1.8	1.5	1.6	1.4	1.5
MIN	1.4	1.5	1.5	1.5	1.6	1.6	1.7	1.5	1.3	1.2	1.1	1.2
CAL YR	2010	TOTAL	563.8	MEAN	1.54	MAX	2.1	MIN	0.94	AC-FT	1120	
WTR YR	2011	TOTAL	559.2	MEAN	1.53	MAX	1.9	MIN	1.1	AC-FT	1110	

MAX DISCH: 3.44 CFS AT 15:30 ON JUL 11,2011 GH 0.56 FT SHIFT 0.02 FT

MAX GH: 0.77 FT AT 09:15 ON NOV 24,2010 (BACKWATER FROM ICE)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LITTLE SPRING CREEK AT MEDANO RANCH NEAR MOSCA, CO
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
BIG SPRING CREEK AT MEDANO RANCH NEAR MOSCA
Water Year 2011

Location.--	Lat 37° 44' 4", long 105° 39' 49" referenced to North American Datum of 1983 (Medano Ranch, CO quad, scale 1:24,000), UTM Zone 13 441521 E and 4176551 N, in NW ¼ NE ¼ sec. 9, T.40 N., R.12 E., New Mexico Principal Meridian, Alamosa County, CO, Hydrologic Unit 13010003, on left bank ¼ mi above Los Ojos Diversion.
Drainage Area and Period of Record.--	0.3 mi ² . 2000 to current year.
Equipment.--	Data collection platform (Sutron SatLink2), and a float-operated shaft encoder in a 30-inch diameter pipe well and CMP extension gage shelter. The primary reference gage is a staff gage at LEW in a modified 4 foot Parshall flume. No auxiliary gage. The flume was modified on May 19, 2010.
Hydrologic Conditions.--	Flow primarily due to groundwater accretions.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log as backup. Record is complete and reliable except for Dec. 31, 2010 – Jan. 20, Jan. 22 – Mar. 14, 2011 when ice in well was affecting floats. Stage-discharge relation was affected by ice Nov. 23-28, 30, Dec. 8, 12, 30, 2010, Jan.21, 2011. There was one shaft encoder correction of -0.02 ft on Aug. 18, 2011, which was prorated from previous visit.
Datum Corrections.--	A formal inspection with levels was not performed this year. Since this Parshall Flume has been modified by reducing the area by one-half, it is not expected to perform as a Parshall flume. Inspection and levels were last completed on the flume on July 3, 2008, with an assumed elevation of 0.000 at the flume floor adjacent to the staff gage at REW. Levels indicate that the flume floor slopes inconsistently downward toward REW by approximately 0.06 ft. Inspection included measurement of all pertinent Parshall Flume dimensions.
Rating.--	The control was a standard four foot Parshall flume until May 19, 2010, when it was modified in an attempt to eliminate the inlet being plugged by sand settling in the flume. Before the modification, the flume was continuously submerged to some extent, and the inlet was often buried and plugged by sand settling in the flume. Since the flume was modified it is still continually submerged, but sand doesn't regularly bury or plug the inlet. Shifting is caused by continuously changing sand deposition in, above, and below flume. The rating (BIGSPGCO03) was developed using measurements made after the flume was modified and this rating was used again for water year 2011. Fourteen discharge measurements (Nos. 119-132) were made during the year ranging in discharge from 5.28 to 7.84 cfs. They cover the discharge range experienced except for lower daily flows Aug. 10-13, 15-20. The peak flow of 7.91 cfs occurred at 1245 on Mar. 14, 2011 at a gage height of 1.31 ft with a shift of 0.28 ft. The maximum gage-height of 2.23 ft occurred at 0800 Nov. 26, 2010 and was caused by backwater from ice.
Discharge.--	Shifting control method was used during all open water periods. Shifts were applied as defined by measurements and distributed by time. Measurement shifts ranged from -0.07 to 0.28 ft. All were given full weight except for Nos. 119, 121, 122, and 125, which were adjusted as much as 3% to smooth shift distribution. Stage-discharge relation was affected by ice and discharge estimated Nov. 23-28, 30, Dec. 8, 12, 30, 2010, Jan.21, 2011.
Special Computations.--	Discharge for periods of no gage-height and ice affected record was estimated using measurements, weather records, and hydrographic comparison with nearby station Little Spring Creek at Medano Ranch.
Remarks.--	Record is good, except for Mar. 15 through Apr. 5, which is fair. and, periods of no gage-height and ice affected record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	Construct new control.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

BIG SPRING CREEK AT MEDANO RANCH NEAR MOSCA

RATING TABLE-- BIGSPGCO03 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

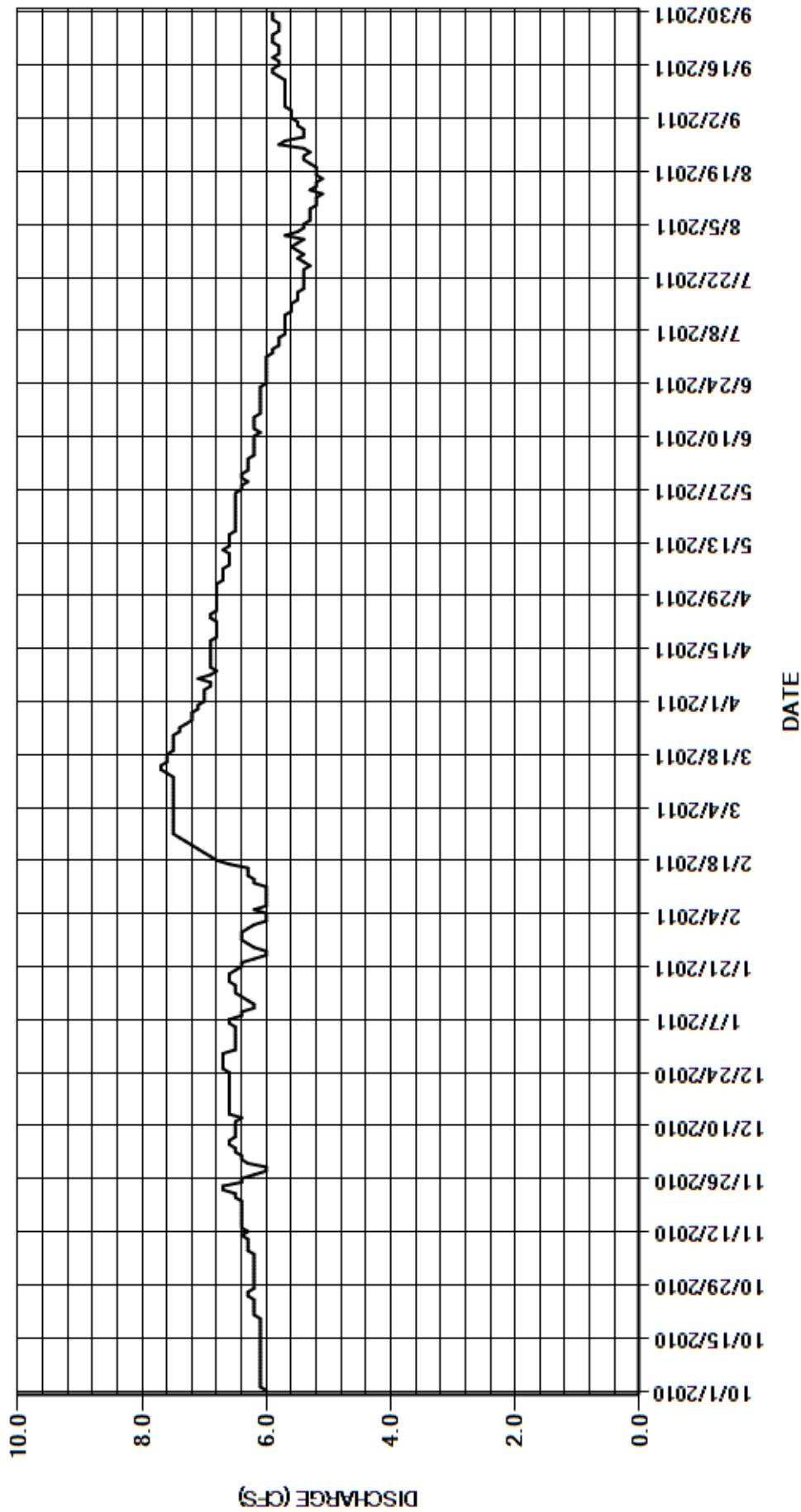
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.0	6.2	6.4	e6.5	e6.2	e7.5	7.0	6.8	6.3	6.0	5.4	5.5
2	6.1	6.2	6.4	e6.5	e6.0	e7.5	7.0	6.8	6.3	5.9	5.7	5.6
3	6.1	6.2	6.5	e6.5	e6.0	e7.5	7.0	6.7	6.3	5.9	5.5	5.6
4	6.1	6.2	6.5	e6.5	e6.0	e7.5	7.0	6.7	6.3	5.8	5.4	5.6
5	6.1	6.2	6.6	e6.5	e6.2	e7.5	6.9	6.7	6.2	5.8	5.4	5.7
6	6.1	6.2	6.6	e6.6	e6.0	e7.5	6.9	6.7	6.2	5.8	5.3	5.7
7	6.1	6.3	6.5	e6.6	e6.0	e7.5	7.1	6.6	6.2	5.7	5.3	5.7
8	6.1	6.3	e6.5	e6.4	e6.0	e7.5	6.9	6.6	6.2	5.7	5.3	5.7
9	6.1	6.3	6.5	e6.4	e6.0	e7.5	6.8	6.6	6.2	5.7	5.3	5.7
10	6.1	6.3	6.5	e6.2	e6.0	e7.5	6.9	6.6	6.2	5.7	5.2	5.7
11	6.1	6.4	6.5	e6.2	e6.0	e7.5	6.9	6.7	6.1	5.7	5.2	5.7
12	6.1	6.3	e6.4	e6.3	e6.2	e7.5	6.9	6.6	6.2	5.7	5.2	5.7
13	6.1	6.4	6.6	e6.4	e6.2	e7.6	6.9	6.6	6.2	5.6	5.1	5.8
14	6.1	6.4	6.6	e6.5	e6.3	e7.7	6.9	6.6	6.2	5.6	5.3	5.9
15	6.1	6.4	6.6	e6.5	e6.3	7.7	6.9	6.6	6.2	5.6	5.2	5.9
16	6.1	6.4	6.6	e6.5	e6.3	7.6	6.9	6.5	6.1	5.5	5.2	5.8
17	6.1	6.4	6.6	e6.6	e6.6	7.6	6.9	6.5	6.1	5.5	5.1	5.8
18	6.1	6.4	6.6	e6.6	e6.8	7.6	6.8	6.5	6.1	5.5	5.2	5.9
19	6.1	6.4	6.6	e6.6	e6.9	7.5	6.8	6.5	6.1	5.4	5.2	5.8
20	6.1	6.4	6.6	e6.5	e7.0	7.5	6.8	6.5	6.1	5.4	5.2	5.8
21	6.2	6.5	6.6	e6.4	e7.1	7.5	6.8	6.5	6.1	5.4	5.3	5.8
22	6.2	6.5	6.6	e6.4	e7.2	7.5	6.8	6.5	6.1	5.4	5.4	5.9
23	6.2	e6.7	6.6	e6.2	e7.3	7.5	6.9	6.5	6.1	5.4	5.4	5.9
24	6.2	e6.7	6.6	e6.0	e7.4	7.4	6.9	6.5	6.0	5.4	5.3	5.9
25	6.2	e6.4	6.7	e6.0	e7.5	7.4	6.8	6.5	6.0	5.3	5.4	5.8
26	6.3	e6.4	6.7	e6.2	e7.5	7.3	6.8	6.5	6.0	5.4	5.8	5.8
27	6.3	e6.2	6.7	e6.3	e7.5	7.2	6.8	6.4	6.0	5.5	5.7	5.8
28	6.2	e6.0	6.7	e6.4	e7.5	7.2	6.8	6.4	6.0	5.4	5.4	5.9
29	6.2	6.0	6.7	e6.4	---	7.2	6.8	6.3	6.0	5.5	5.4	5.9
30	6.2	e6.3	e6.5	e6.4	---	7.1	6.8	6.4	6.0	5.6	5.4	5.9
31	6.2	---	e6.5	e6.3	---	7.1	---	6.4	---	5.5	5.5	---
TOTAL	190.3	190.0	203.6	198.4	184.0	231.2	206.4	203.3	184.1	173.3	165.7	173.2
MEAN	6.14	6.33	6.57	6.40	6.57	7.46	6.88	6.56	6.14	5.59	5.35	5.77
AC-FT	377	377	404	394	365	459	409	403	365	344	329	344
MAX	6.3	6.7	6.7	6.6	7.5	7.7	7.1	6.8	6.3	6.0	5.8	5.9
MIN	6.0	6.0	6.4	6.0	6.0	7.1	6.8	6.3	6.0	5.3	5.1	5.5
CAL YR	2010	TOTAL	2264.9	MEAN	6.21	MAX	7.2	MIN	5.2	AC-FT	4490	
WTR YR	2011	TOTAL	2303.5	MEAN	6.31	MAX	7.7	MIN	5.1	AC-FT	4570	

MAX DISCH: 7.91 CFS AT 12:45 ON MAR 14,2011 GH 1.31 FT SHIFT 0.28 FT

MAX GH: 2.23 FT AT 08:00 ON NOV 26,2010 (BACKWATER FROM ICE)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

BIG SPRING CREEK AT MEDANO RANCH NEAR MOSCA
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08230500 CARNERO CREEK NEAR LA GARITA
Water Year 2011

Location.--	Lat 37° 51' 35", long 106° 19' 10" referenced to North American Datum of 1983 (Twin Mountains SE, CO quad, scale 1:24,000), UTM Zone 13 383929 E and 4191069 N, in SW ¼ NE ¼ sec. 28, T.42 N., R.6 E., New Mexico Principal Meridian, Saguache County, CO, Hydrologic Unit 13010004, on left bank 5.5 mi downstream from the North Fork and 4 mi northwest of La Garita, CO.
Drainage Area and Period of Record.--	117 mi ² (from topographic maps.) April 1919 to current year. Partial year only most years 1919 to 1944.
Equipment.--	Graphic water stage recorder, data collection platform (Sutron Satlink), and a float-operated shaft encoder in a 42 inch diameter metal shelter and concrete well. The primary reference gage is a drop tape from reference point on shelf. An outside gage was installed on Sep. 8, 2011.
Hydrologic Conditions.--	Gage is located in lower mountain valley meadows with small homes established in the area. There are some diversions above gage for irrigation of meadows used for grazing stock.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for: Jan. 1-5, 2011 when ice in well was affecting floats; Jan. 6, 2011 to Mar. 3, 2011 when station was closed for the winter. The stage-discharge relation was affected by ice Nov. 18 - Dec. 31, 2010, Mar. 4 - Apr. 3, 2011. There were no instrumentation corrections made to the shaft encoder during the year.
Datum Corrections.--	Levels were run to the reference point (RP) inside the gage on Aug. 30, 2011 using B.M. 1 as base. The gage RP elevation was within the allowable limits, so no correction was made. Two peg tests were ran on July 28, 2011 and September 26, 2011 the September 26, 2011 indicated a minor adjustemtn was needed and was made.
Rating.--	Control is a concrete, broad-crested weir about 25 feet downstream from the gage. Stream banks affect flow at higher stages. Minor shifting occurs as a result of scour and fill in gage pool. Rating 16 was developed in the spring of WY2010 and was used again this year to reflect changes in the approach condition at the gage due to the gage pool being cleaned when the gage was reset August 28, 2009. In addition, the upper end of the rating curve was adjusted to better fit high flow measurements. Rating 16 is well defined from 0.40 to approximately 6 cfs and approximately 12 cfs to 31 cfs; moderately well defined from 6 to 12 cfs, and from 30 to 161 cfs; and poorly defined outside those ranges. Fifteen discharge measurements (Nos. 170-184) were made during the water year, ranging in discharge from 0.40 to 6.32 cfs. They covered the discharge range experienced, except for the higher flows on Apr. 6-7, 9, 19, 2011. The peak flow of 31.4 cfs occurred at 1800 on Aug. 26, 2011 at a gage height of 2.57 ft with a shift of +0.01 ft. It exceeded high measurement No. 177 made on April 20, 2011 at a gage-height of 2.07 ft by 0.50 ft in stage.
Discharge.--	Shifting-control method was used for all periods of good record. Record was estimated Nov. 18 - Dec. 31, 2010, Mar. 4 – Apr. 3, 2011 because the stage-discharge relation was affected by ice. Measurement shifts ranged from -0.01 to +0.02 feet. All measurements were given full weight and applied except for Nos. 170, 179 and 182, which were rated fair and poor and were adjusted as much as 8% to smooth shift distribution.
Special Computations.--	Discharge was estimated for periods of no gage-height and ice affected record using discharge measurements, hydrographic comparison with La Garita Creek near La Garita, and weather records.
Remarks.--	Record is good, except for periods of no gage-height and ice-affected record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08230500 CARNERO CREEK NEAR LA GARITA

RATING TABLE-- CARLAGCO16 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.1	2.4	e1.6	e1.0	e1.5	e2.0	e5.4	3.7	3.5	0.95	2.2	1.4
2	1.2	2.1	e1.8	e1.0	e1.3	e2.2	e6.0	2.4	3.7	1.0	2.7	1.3
3	1.3	2.7	e2.0	e1.0	e1.0	e2.0	e6.2	4.3	3.9	0.96	2.6	1.9
4	1.3	2.4	e2.0	e1.3	e1.5	e2.0	5.0	5.2	3.6	0.87	3.0	1.6
5	1.6	2.1	e2.0	e1.3	e1.5	e1.9	5.3	4.7	3.4	0.75	3.2	1.2
6	1.6	2.2	e2.0	e1.3	e1.3	e1.8	7.0	4.4	3.5	0.73	3.8	1.0
7	1.6	2.4	e2.0	e1.5	e1.3	e1.8	8.1	4.6	3.4	0.94	2.6	1.2
8	2.3	2.1	e2.0	e1.5	e1.3	e1.8	6.2	5.1	3.3	1.5	1.5	1.6
9	3.5	2.3	e1.8	e1.5	e1.0	e1.9	6.8	5.3	3.1	1.4	0.99	2.5
10	2.5	1.4	e2.0	e1.3	e1.0	e1.9	5.6	5.0	3.1	0.88	0.76	2.6
11	2.1	1.1	e1.8	e1.2	e1.3	e2.1	4.2	4.7	3.0	1.1	0.70	2.2
12	2.0	1.6	e2.0	e1.3	e1.3	e2.4	5.3	5.3	2.8	2.9	0.72	2.5
13	2.0	1.8	e2.0	e1.5	e1.5	e3.0	5.2	4.4	2.6	2.9	0.75	2.5
14	2.0	1.9	e2.3	e1.5	e1.5	e3.6	5.4	4.5	2.5	1.4	0.76	2.3
15	2.0	1.7	e2.0	e1.5	e1.5	e4.2	3.9	5.1	2.3	1.0	0.85	3.4
16	2.0	1.9	e1.8	e1.5	e1.8	e4.4	3.8	4.8	2.2	0.88	0.93	3.3
17	2.0	1.7	e1.8	e1.8	e1.8	e4.8	5.0	5.0	2.1	0.68	0.73	4.8
18	2.0	e2.0	e1.5	e1.8	e2.0	e5.2	5.5	5.1	2.2	0.50	0.82	4.0
19	2.5	e2.2	e1.5	e1.8	e2.0	e5.2	6.6	4.9	2.2	0.41	0.73	2.8
20	2.9	e2.2	e1.8	e1.5	e1.8	e5.0	6.2	4.8	2.1	1.6	0.62	2.2
21	2.7	e2.2	e2.0	e1.5	e1.5	e5.0	5.4	4.9	2.3	2.5	0.75	1.8
22	2.9	e2.0	e2.0	e1.5	e1.5	e4.6	5.7	4.5	2.1	1.7	1.8	1.6
23	2.8	e2.0	e2.0	e1.5	e1.5	e4.0	5.4	4.7	1.8	1.3	2.0	1.5
24	2.7	e1.8	e1.8	e1.3	e1.5	e4.2	5.1	4.5	1.7	0.86	1.2	1.4
25	2.5	e1.8	e1.8	e1.3	e1.8	e4.0	5.8	4.4	1.3	0.70	1.1	1.4
26	2.2	e1.5	e1.5	e1.5	e1.8	e4.0	5.0	4.1	1.1	0.69	4.6	1.4
27	1.5	e1.5	e1.8	e1.8	e1.8	e4.0	4.1	4.0	0.97	1.1	3.4	1.4
28	1.6	e1.8	e1.8	e1.8	e2.0	e4.4	3.9	4.1	0.88	0.96	2.3	1.4
29	2.0	e1.5	e1.5	e2.0	---	e4.6	4.1	4.4	0.85	0.80	1.8	1.4
30	2.3	e1.5	e1.3	e2.0	---	e4.6	3.8	4.4	0.96	1.2	1.7	1.4
31	2.8	---	e1.3	e1.8	---	e5.0	---	4.0	---	1.3	1.6	---
TOTAL	65.5	57.8	56.5	46.1	42.6	107.6	161.0	141.3	72.46	36.46	53.21	61.0
MEAN	2.11	1.93	1.82	1.49	1.52	3.47	5.37	4.56	2.42	1.18	1.72	2.03
AC-FT	130	115	112	91	84	213	319	280	144	72	106	121
MAX	3.5	2.7	2.3	2.0	2.0	5.2	8.1	5.3	3.9	2.9	4.6	4.8
MIN	1.1	1.1	1.3	1.0	1.0	1.8	3.8	2.4	0.85	0.41	0.62	1.0

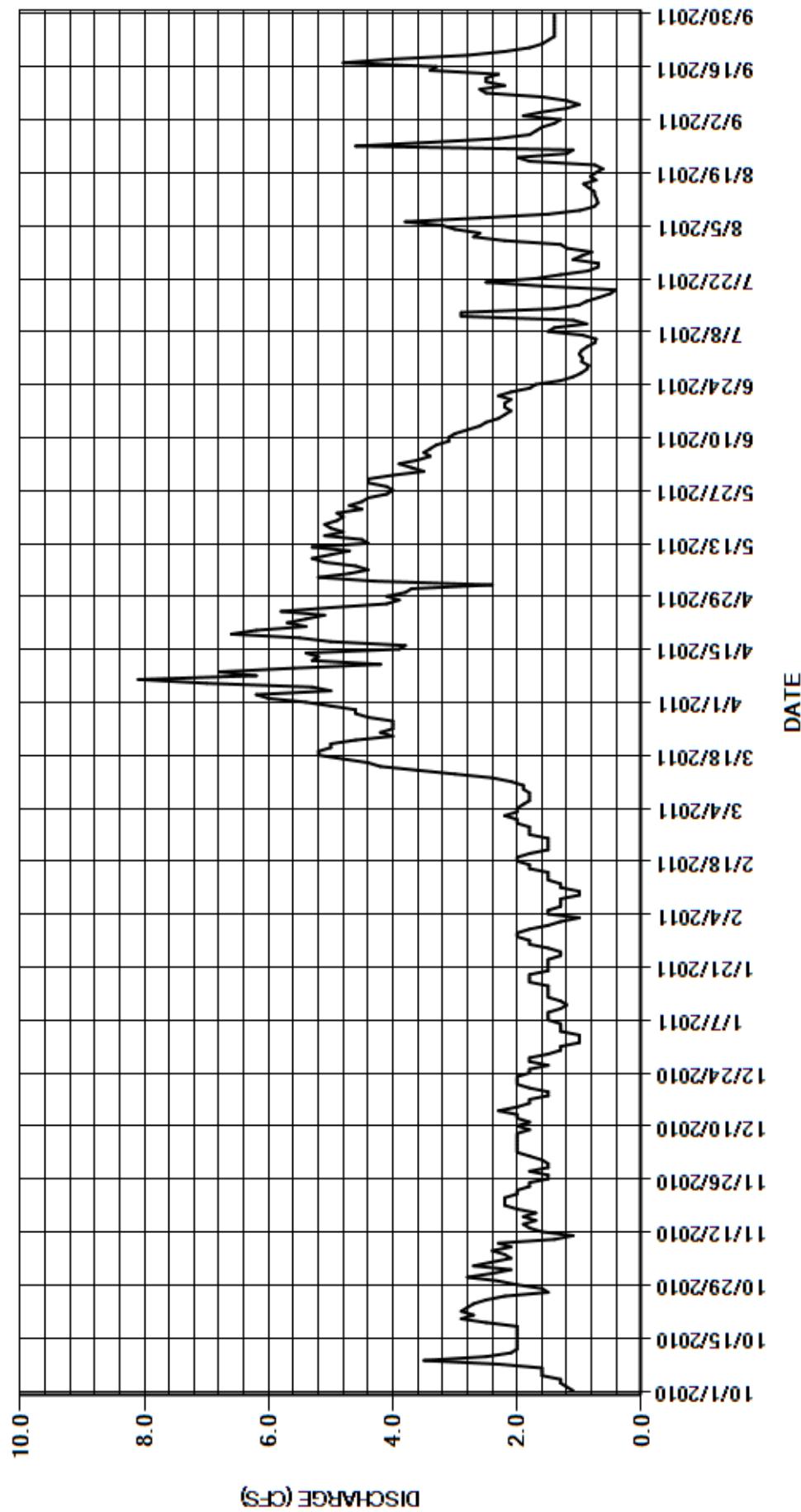
CAL YR	2010	TOTAL	2129.03	MEAN	5.83	MAX	65	MIN	0.40	AC-FT	4220
WTR YR	2011	TOTAL	901.53	MEAN	2.47	MAX	8.1	MIN	0.41	AC-FT	1790

MAX DISCH: 31.4 CFS AT 18:00 ON AUG 26,2011 GH 2.57 FT SHIFT 0.01 FT

MAX GH: 2.57 FT AT 18:00 ON AUG 26,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08230500 CARNERO CREEK NEAR LA GARITA
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08231000 LA GARITA CREEK NEAR LA GARITA
Water Year 2011

Location.--	Lat 37°48'48", long 106°19'8" referenced to North American Datum of 1983 (Twin Mountains SE, CO quad, scale 1:24,000), UTM Zone 13 383918 E and 4185927 N, in NW ¼ SE ¼ sec. 9, T.41 N., R.6 E., New Mexico Principal Meridian, Saguache County, CO, Hydrologic Unit 13010004, on left bank 4.5 mi downstream from Little La Garita Creek and 4.5 mi southwest of La Garita, CO.
Drainage Area and Period of Record.--	61 mi ² . Apr. 1, 1919 to Sept. 30, 1947 (seasonal records only most years), Oct. 1, 1947 to current year.
Equipment.--	Water-stage recorder and data collection platform (Sutron Satlink2), a float-operated shaft encoder and a tipping bucket rain gage in a 3 ft. corrugated metal pipe shelter and concrete well. The primary reference gage is a drop tape from reference point on shelf. Equipment was upgraded, SDR installed and chart recorder removed May 9, 2011. Outside gage installed September 9, 2011.
Hydrologic Conditions.--	Drainage basin is primarily Rio Grande National Forest and is generally sub-alpine terrain. The mean basin elevation is 10,300 ft (from Stream Stats, 2009).
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup until May 9, 2011, then DCP log and SDR log as backup. Record is complete and reliable except for Feb. 11-15, 2011 when the floats were affected by ice in well. The stage-discharge relation was affected by ice Nov. 13, 2010 to Feb. 10, 2011 and Feb. 16 to Feb. 20, 2011. Nine unit values were estimated by manually prorating the gage-height while equipment was upgraded May 9, 2011. One unit value was filled from chart on Nov. 8 when oil cylinder was setup, and one unit value was adjusted on March 3, 2011, when chart recorder was setup. Five instrument corrections ranging from -0.02 to +0.02 ft were made this year and all were prorated from previous visit.
Datum Corrections.--	Levels were run to the Reference Point (RP) inside the gage on August 31, 2011, using B.M. No. 1 as base. The RP elevation was found to be within allowable limits, so no correction was required or made.
Rating.--	The control is a rock weir structure approximately 30 feet below the gage. Minor shifting occurs mainly due to the movement of streambed materials, especially at high stages. Rating No. 13 in use since October 1, 2009 was used again this year. Fifteen measurements (244-258) were made this year, ranging in discharge from 2.54 to 12.6 cfs. The measurements cover the range experienced except for the lower daily flows on Oct. 1-7, 16, 27, 28, Nov. 10-30, Dec. 1, 2010, Jan. 10-12, 15, Feb. 2, 4-12, 14, Jul. 18, Aug. 10, 11, 17-21, 24-26, Sep. 2, 3, 5-7, 30. The peak flow of 22.2 cfs occurred at 1730 on August 5, 2011 at a gage height of 2.31 feet with a shift of +0.02 feet. It exceeded high measurement No. 251 with a gage-height of 2.11 made April 19, 2011 by 0.20 feet in stage.
Discharge.--	Shifting control method was used for all open water periods. The stage-discharge relation was affected by ice and discharge estimated Nov. 13, 2010 to Feb. 10, 2011 and Feb. 16 to Feb. 20, 2011. Shifts were applied as defined by measurements and prorated by time. The measurement shifts ranged from -0.03 to +0.03 feet. All open water measurements were given full weight except Nos. 245, 249, and 254 to 256 which were adjusted as much as 5% to smooth shift distribution.
Special Computations.--	Discharge for periods of no gage-height and ice-affected record were estimated using discharge measurements, weather records and comparison with nearby stations.
Remarks.--	Record is good, except for periods of no gage-height and ice-affected record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08231000 LA GARITA CREEK NEAR LA GARITA

RATING TABLE-- LAGLAGCO13 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

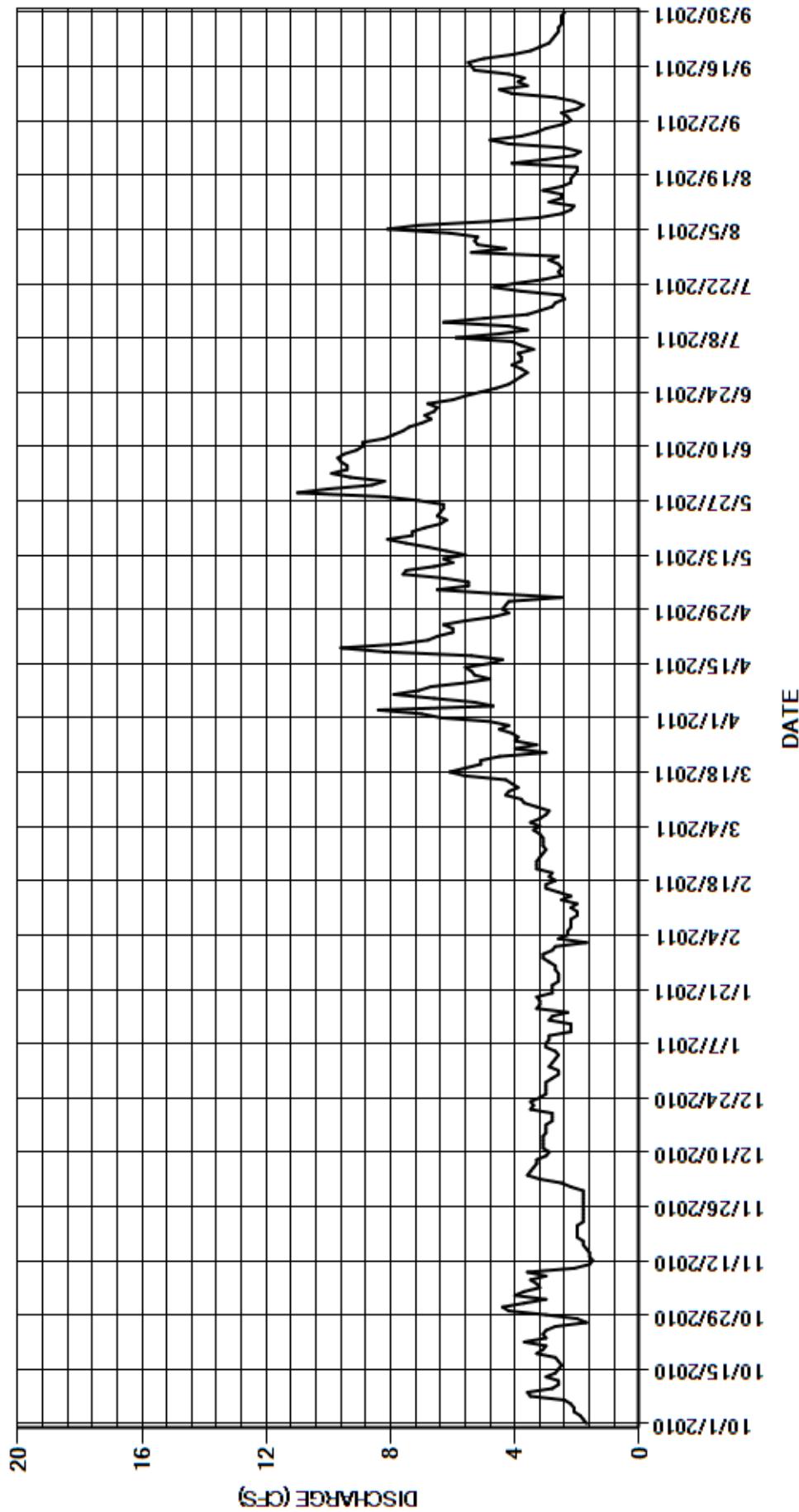
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.7	3.7	e2.2	e2.9	e2.7	3.1	6.4	4.2	8.2	4.1	5.2	2.5
2	1.8	3.0	e2.5	e2.8	e1.7	3.2	7.0	2.5	9.3	3.8	5.3	2.2
3	1.9	4.0	e3.2	e2.7	e2.6	3.4	8.4	4.6	9.9	3.8	5.2	2.3
4	2.1	3.7	e3.6	e2.6	e2.3	3.2	4.7	6.5	9.4	3.9	6.1	2.5
5	2.1	3.2	e3.5	e2.7	e2.3	3.5	5.3	5.5	9.4	3.4	8.1	2.0
6	2.2	3.3	e3.4	e3.0	e2.2	3.2	6.6	5.5	9.6	3.8	7.1	1.8
7	2.4	3.5	e3.3	e3.0	e2.2	3.0	7.9	6.3	9.7	4.1	4.8	2.1
8	3.5	3.0	e3.3	e2.9	e2.2	2.9	7.1	7.6	9.5	5.9	3.2	2.7
9	3.6	3.6	e3.0	e2.9	e2.0	3.3	6.7	7.5	9.1	4.5	2.5	4.1
10	2.8	2.1	e2.9	e2.2	e2.0	3.7	5.6	6.6	8.9	3.6	2.2	4.5
11	2.6	1.6	e3.1	e2.2	e2.2	3.8	4.8	6.0	8.9	4.2	2.1	3.6
12	2.6	1.5	e3.1	e2.2	e2.0	4.3	5.3	6.3	8.2	6.3	2.9	3.9
13	3.0	e1.6	e3.1	e2.9	e2.5	4.2	5.4	5.6	7.9	5.0	2.5	3.7
14	2.7	e1.6	e3.1	e2.8	e2.2	3.9	5.6	6.2	7.6	3.6	2.5	4.2
15	2.6	e1.7	e3.0	e2.3	e2.6	4.1	4.8	6.8	7.4	3.2	3.1	5.3
16	2.5	e1.8	e3.0	e3.3	e3.0	4.3	4.4	7.5	7.0	2.8	2.5	5.4
17	2.6	e1.8	e3.0	e3.2	e3.0	5.6	5.4	8.1	6.7	2.7	2.2	5.5
18	2.7	e2.0	e2.8	e3.2	e2.7	6.1	8.2	7.3	6.9	2.4	2.2	5.0
19	3.3	e2.0	e2.8	e3.3	e2.9	5.6	9.6	7.3	6.6	2.5	2.1	4.1
20	3.1	e2.0	e2.8	e2.8	e2.8	5.1	7.7	6.9	6.5	3.8	2.0	3.5
21	3.0	e2.0	e3.5	e2.8	3.3	5.1	6.8	6.4	6.8	4.7	2.0	3.2
22	3.7	e1.8	e3.4	e2.8	3.3	4.5	6.5	6.2	6.0	4.0	4.1	2.9
23	3.0	e1.8	e3.5	e2.6	3.3	3.0	6.0	6.5	5.6	3.1	3.0	2.8
24	3.1	e1.8	e3.2	e2.6	3.2	4.0	6.0	6.4	5.1	2.5	2.1	2.7
25	3.0	e1.8	e3.0	e2.6	3.1	3.3	6.3	6.3	4.6	2.6	1.9	2.6
26	2.7	e1.8	e3.0	e2.7	3.0	4.0	5.6	6.3	4.2	2.5	2.4	2.6
27	1.7	e1.8	e3.0	e2.7	3.1	3.9	4.7	7.1	4.0	2.6	4.2	2.5
28	2.0	e1.8	e3.0	e2.9	3.1	4.1	4.2	8.2	3.8	2.9	4.8	2.5
29	3.0	e1.8	e2.8	e3.1	---	4.5	4.4	11	3.6	2.6	3.8	2.5
30	4.2	e1.8	e2.6	e3.1	---	4.2	4.3	10	3.8	5.4	3.3	2.4
31	4.4	---	e2.6	e2.8	---	4.8	---	8.6	---	4.3	3.0	---
TOTAL	85.6	68.9	94.3	86.6	73.5	124.9	181.7	207.8	214.2	114.6	108.4	97.6
MEAN	2.76	2.30	3.04	2.79	2.62	4.03	6.06	6.70	7.14	3.70	3.50	3.25
AC-FT	170	137	187	172	146	248	360	412	425	227	215	194
MAX	4.4	4.0	3.6	3.3	3.3	6.1	9.6	11	9.9	6.3	8.1	5.5
MIN	1.7	1.5	2.2	2.2	1.7	2.9	4.2	2.5	3.6	2.4	1.9	1.8
CAL YR	2010	TOTAL	2505.3	MEAN	6.86	MAX	47	MIN	0.50	AC-FT	4970	
WTR YR	2011	TOTAL	1458.1	MEAN	3.99	MAX	11	MIN	1.5	AC-FT	2890	

MAX DISCH: 22.2 CFS AT 17:30 ON AUG 05,2011 GH 2.31 FT SHIFT 0.02 FT (RAIN EVENT)

MAX GH: 2.31 FT AT 17:30 ON AUG 05,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08231000 LA GARITA CREEK NEAR LA GARITA
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08235250 ALAMOSA RIVER ABOVE WIGHTMAN FORK NEAR JASPER
Water Year 2011

Location.--	Lat 37°24'09", long 106°31'17", in SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec.35, T.37 N., R.4 E., Rio Grande Co. Hydrologic Unit 13010002, Rio Grande National Forest, on left bank 650 ft. upstream from Wightman Fork, 1.8 mi downstream from Bitter Creek, 4.1 mi west of Jasper, and 4.2 mi southeast of Summitville.
Drainage Area and Period of Record.--	37.8 mi ² . Jul. 1995 to current year, no winter record, missing some years.
Equipment.--	Shelter is 4 ft x 4 ft x 8 ft steel building. Gage-height is collected using a Sutron Accubar pressure transducer. A Hydrolab instrument collects water temperature, conductance, and pH data. A Sutron Satlink2 is used to transmit and store data. The Accubar gage-height is set using outside staff gage. This station was moved 500 feet upstream in November 2009. A bank operated cableway was also installed at the site in the fall of 2009 to provide the means to obtain high flow measurements.
Hydrologic Conditions.--	Undeveloped subalpine and alpine forest.
Gage-Height Record.--	Primary record is 15-minute transmitted data with Satlink2 log as backup. Period of operation: Oct. 1 to 30 , 2010 and May 2 to Sep. 30, 2011. Record is complete. The stage-discharge relationship was affected by ice on the control Oct. 26-30, 2010.
Datum Corrections.--	Levels were not run at this station this year.
Rating.--	Control is cobble channel and banks. Rating ALAWIGCO_07 was used to produce flow record for Oct. 1-30, 2010. Rating ALAWIGCO08a was developed using eight measurements made from May 21, 2011 to Oct. 8, 2011. This rating was used to produce flow record from May 2 until Sep. 30, 2011. Control and stream are covered by ice during the winter. Nine discharge measurements (Nos. 61-69) were made during the period of record. The measurements ranged in discharge from 10.7 to 430 cfs. Measurements covered the discharge range encountered, except for higher mean daily flows on Jun. 5-7, 2011, and the lower daily flow of Oct. 20, 2010. The peak flow of 655 cfs occurred at 1915 on Jun. 6, 2011 at a gage height of 5.90 ft. with a shift of 0 ft using rating ALAWIGCO08a. It exceeded high measurement No. 64 (GH = 5.56 ft) made May 29, 2011, by 0.34 feet in stage.
Discharge.--	Shifting control method was used during the entire period of record. Shifts were applied as defined by measurements and distributed by time and events. Measurements show shifts varied from +0.02 to +0.28 ft. with rating ALAWIGCO_07 and -0.13 to +0.03 with rating ALAWIGCO08a. All were given full weight and applied except Nos. 63-66, 68, and 69, which were adjusted as much as 5% to smooth shift distribution. Stage-discharge relationship was affected by ice on control and discharge estimated Oct. 26-30, 2010.
Special Computations.--	Discharge for period of estimation was based on weather records, partial stage records, and comparison with nearby stations Wightman Fork at Mouth near Jasper and Alamosa River below Ranger Creek.
Remarks.--	Due to the instability of the channel and control, the record is rated fair. Periods of estimation are rated poor. Station maintained and record developed by private consultant; record reviewed by Div 3 personnel.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08235250 ALAMOSA RIVER ABOVE WIGHTMAN FORK NEAR JASPER

RATING TABLE-- ALAWIGCO07 USED FROM 01-OCT-2010 TO 31-OCT-2010
ALAWIGCO08a USED FROM 01-MAY-2011 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	---	---	---	---	---	---	---	305	158	29	29
2	15	---	---	---	---	---	---	28	351	138	40	26
3	13	---	---	---	---	---	---	28	317	128	38	23
4	13	---	---	---	---	---	---	25	376	115	37	23
5	13	---	---	---	---	---	---	31	437	102	32	22
6	13	---	---	---	---	---	---	44	477	100	27	20
7	12	---	---	---	---	---	---	70	461	104	24	20
8	22	---	---	---	---	---	---	103	413	101	22	19
9	18	---	---	---	---	---	---	99	391	90	20	32
10	16	---	---	---	---	---	---	84	379	80	19	26
11	15	---	---	---	---	---	---	85	382	119	18	23
12	14	---	---	---	---	---	---	71	350	116	18	23
13	13	---	---	---	---	---	---	88	311	79	16	22
14	12	---	---	---	---	---	---	120	311	64	22	26
15	12	---	---	---	---	---	---	151	335	56	17	33
16	11	---	---	---	---	---	---	190	352	50	16	43
17	11	---	---	---	---	---	---	183	342	47	14	53
18	11	---	---	---	---	---	---	131	305	44	14	46
19	11	---	---	---	---	---	---	103	271	43	13	40
20	10	---	---	---	---	---	---	85	225	44	14	36
21	11	---	---	---	---	---	---	76	201	43	14	34
22	11	---	---	---	---	---	---	80	222	37	21	30
23	12	---	---	---	---	---	---	100	237	34	17	28
24	13	---	---	---	---	---	---	108	243	32	15	26
25	13	---	---	---	---	---	---	109	224	32	16	24
26	e12	---	---	---	---	---	---	162	197	32	14	22
27	e12	---	---	---	---	---	---	238	178	38	40	21
28	e12	---	---	---	---	---	---	344	172	32	40	20
29	e12	---	---	---	---	---	---	414	171	36	40	19
30	e13	---	---	---	---	---	---	322	187	42	37	19
31	---	---	---	---	---	---	---	228	---	32	31	---
TOTAL	391	---	---	---	---	---	---	3900	9123	2168	735	828
MEAN	13.0	---	---	---	---	---	---	130	304	69.9	23.7	27.6
AC-FT	776	---	---	---	---	---	---	7740	18100	4300	1460	1640
MAX	22	---	---	---	---	---	---	414	477	158	40	53
MIN	10	---	---	---	---	---	---	25	171	32	13	19

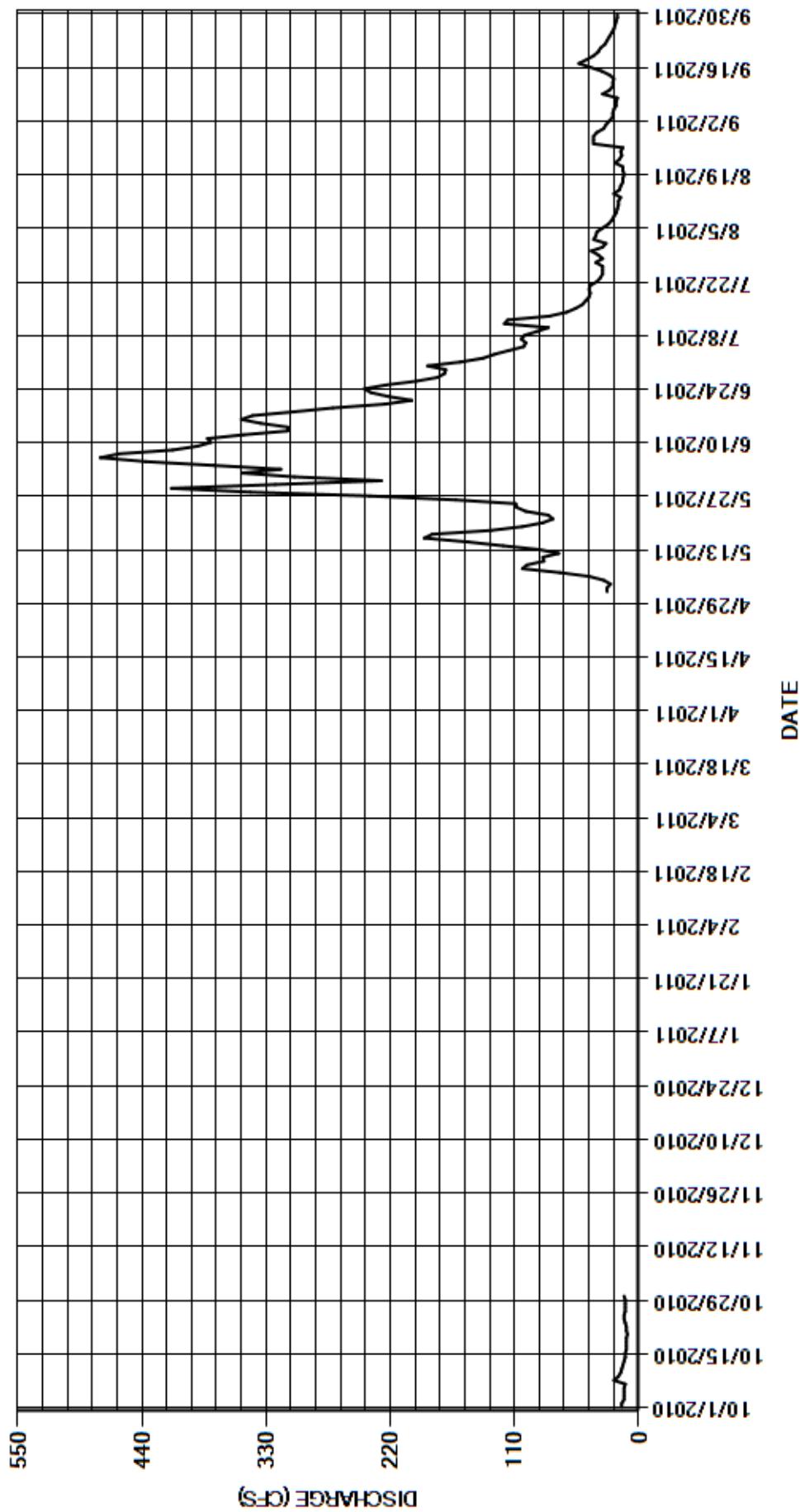
CAL YR	2010	TOTAL	18339	MEAN	100	MAX	700	MIN	10	AC-FT	36380 (PARTIAL YEAR RECORD)
WTR YR	2011	TOTAL	17145	MEAN	94.2	MAX	477	MIN	10	AC-FT	34010 (PARTIAL YEAR RECORD)

MAX DISCH: 655 CFS AT 19:15 ON JUN 06,2011 GH 5.90 FT SHIFT 0 FT

MAX GH: 5.90 FT AT 19:15 ON JUN 06,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08235250 ALAMOSA RIVER ABOVE WIGHTMAN FORK NEAR JASPER
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08235270 WIGHTMAN FORK BELOW CROPSEY CREEK AT SUMMITVILLE
Water Year 2011

Location.-- Lat 37°25'45", long 106°35'4" referenced to North American Datum of 1983 (Summitville, CO quad, scale 1:24,000), UTM Zone 13 359822 E and 4143669 N, in NW ¼ NW ¼ sec. 29, T.37 N., R.4 E., New Mexico Principal Meridian, Rio Grande County, CO, Hydrologic Unit 13010002, on left bank 200 ft downstream from Cropsy Creek, and 0.25 mi east of Summitville, CO.

Drainage Area and Period of Record.-- 4.44 mi². July 1995 to current year (seasonal records only).

Equipment.-- Sutron Accubar non-submersible pressure transducer with Sutron 8200 data collection platform in a 4-ft. by 4-ft. by 8-ft. steel shelter. The primary reference is the outside staff gage. Sutron Accubar non-submersible pressure transducer was calibrated on May 22, 2011 and also set to average the readings.

Hydrologic Conditions.-- Mainly alpine basin above 11,120 ft in elevation, with some subalpine terrain and large reclaimed open pit mine.

Gage-Height Record.-- Record is complete for period of operation from Oct. 1 to Oct. 31, 2010 and from May 7 to Sep. 30, 2011, except for Oct. 31, 2010 due to missing data because equipment was shut down, and Jul. 1-17, 2011 when the pressure transducer orifice was buried. The stage-discharge relationship was affected by ice Oct. 25, 26, 2010 and May 7 - 21, 2011. Gage-height record is not considered reliable Aug. 27 – Sep. 30, 2011 due to large instrument corrections that vary with stage and are undefined. It appears that the pressure transducer malfunctioned on Aug. 27, 2011. During other periods, instrument corrections were applied as needed and prorated by time from previous visit. Spikes in unit values were estimated from surrounding good record. Three unit values were missing on May 22, 2011 while pressure transducer was calibrated and were estimated from surrounding record and on-site observations.

Datum Corrections.-- Levels are not run at this site.

Rating.-- Control is small, low rock and log dam. Channel is also part of the control. The control is subject to change from high water and excavations in the channel upstream. Control and stream ice up during the winter. Rating (WFKCRO05-1) was used all year and is poorly defined. Eight measurements (Nos. 53-60) were made this year ranging in discharge from 0.64 to 43.2 cfs. Measurements cover the discharge range experienced except for lower mean daily flows of Oct. 5, 6, 14-23, 27, 2010 and the higher daily flows of May 26-30, Jun. 1-10, 2011. The peak flow of 178 cfs occurred at 1615 on May 26, 2011 at gage-height of 5.89 ft with a shift of +0.12 ft. The peak flow exceeded high measurement No. 55 made May 30, 2011 (G.H. 4.99 ft) by 0.90 ft.

Discharge.-- Shifting-control method was used for the period of record. Shifts were applied as defined by measurements and distributed by time in Oct. 2010. A variable shift curve was used to redefine the rating during the remainder of the year. Measured shifts ranged from -0.27 ft to +0.12 ft. All were given full weight except for Nos. 54, 56, 57, and 59 which were adjusted as much as 9% to smooth shift distribution.

Special Computations.-- Discharge for periods of missing record, ice affected record, and instrument malfunction were estimated based on hydrographic comparison with Wightman Fork at Mouth near Jasper(WFKMOUCO).

Remarks.-- Record is fair, except estimated daily streamflow which is poor. Due to uncertainties in the upper end of the variable shift curve, all flows greater than 20 cfs should be considered poor. The peak flow is considered poor. Station maintained and record developed by private consultant; record reviewed by Div 3 hydrographic staff.

Recommendations.-- A new accubar pressure transducer will be installed spring of 2012, also a site visit log including documentation of current offset and slope along with adjustments and times of adjustments will be maintained. Staff gage readings should be recorded with every change in offset or slope. If the pressure sensor is painting, multiple readings of Accubar may be needed to obtain a mean instrument gage height. These may be recorded individually or as a range.

STATE OF COLORADO
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08235270 WIGHTMAN FORK BELOW CROPSEY CREEK AT SUMMITVILLE

RATING TABLE-- WFKCROCO05-1 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

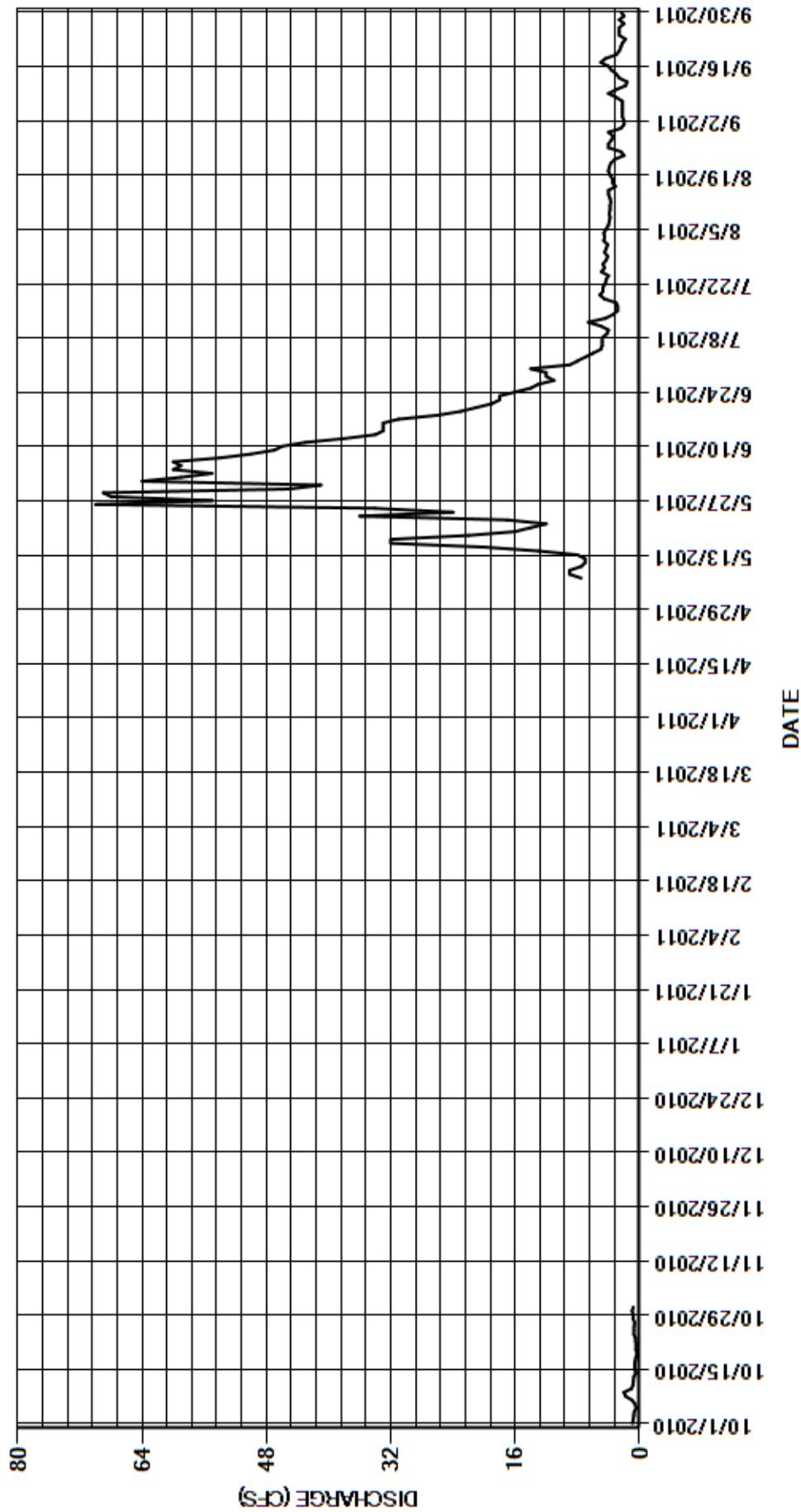
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.89	---	---	---	---	---	---	---	64	e9.0	4.1	e2.0
2	0.83	---	---	---	---	---	---	---	59	e8.0	4.6	e2.0
3	0.73	---	---	---	---	---	---	---	55	e7.0	4.5	e2.2
4	0.68	---	---	---	---	---	---	---	60	e6.0	4.6	e2.2
5	0.42	---	---	---	---	---	---	---	59	e5.0	4.3	e2.2
6	0.59	---	---	---	---	---	---	---	60	e4.8	4.0	e2.2
7	0.97	---	---	---	---	---	---	e7.5	54	e4.8	3.9	e2.2
8	1.8	---	---	---	---	---	---	e9.0	50	e4.8	3.8	e3.0
9	2.0	---	---	---	---	---	---	e9.0	47	e4.2	3.9	e4.0
10	1.0	---	---	---	---	---	---	e7.5	46	e4.0	3.8	e3.0
11	0.84	---	---	---	---	---	---	e7.0	43	e5.0	3.8	e1.8
12	0.79	---	---	---	---	---	---	e7.0	38	e6.6	3.7	e1.6
13	0.73	---	---	---	---	---	---	e8.0	34	e4.4	3.8	e2.6
14	0.46	---	---	---	---	---	---	e13	33	e3.4	4.0	e3.0
15	0.63	---	---	---	---	---	---	e20	33	e2.8	4.0	e3.6
16	0.63	---	---	---	---	---	---	e32	33	e2.8	3.1	e4.0
17	0.57	---	---	---	---	---	---	e32	31	e3.0	3.5	e5.0
18	0.47	---	---	---	---	---	---	e22	26	4.5	3.5	e4.4
19	0.31	---	---	---	---	---	---	e16	23	5.1	3.8	e3.0
20	0.47	---	---	---	---	---	---	e14	21	4.7	4.0	e2.6
21	0.44	---	---	---	---	---	---	e12	19	4.7	3.9	e2.4
22	0.49	---	---	---	---	---	---	17	18	4.4	3.7	e2.2
23	0.52	---	---	---	---	---	---	36	18	4.3	3.2	e1.8
24	0.73	---	---	---	---	---	---	24	16	4.0	2.0	e2.6
25	e0.70	---	---	---	---	---	---	34	14	4.9	2.4	e2.6
26	e0.70	---	---	---	---	---	---	70	13	4.5	4.0	e2.6
27	0.63	---	---	---	---	---	---	55	11	4.7	e4.0	e2.0
28	0.84	---	---	---	---	---	---	68	12	4.3	e3.6	e2.6
29	0.80	---	---	---	---	---	---	69	12	4.1	e3.4	e2.0
30	0.96	---	---	---	---	---	---	45	14	4.5	e4.0	e2.4
31	e0.80	---	---	---	---	---	---	41	---	4.3	e2.4	---
TOTAL	23.42	---	---	---	---	---	---	675.0	1016	148.6	115.3	79.8
MEAN	0.76	---	---	---	---	---	---	27.0	33.9	4.79	3.72	2.66
AC-FT	46	---	---	---	---	---	---	1340	2020	295	229	158
MAX	2.0	---	---	---	---	---	---	70	64	9.0	4.6	5.0
MIN	0.31	---	---	---	---	---	---	7.0	11	2.8	2.0	1.6
CAL YR	2010	TOTAL	2679.74	MEAN	15.1	MAX	156	MIN	0.25	AC-FT	5320 (PARTIAL YEAR RECORD)	
WTR YR	2011	TOTAL	2058.12	MEAN	11.6	MAX	70	MIN	0.31	AC-FT	4080 (PARTIAL YEAR RECORD)	

MAX DISCH: 178 CFS AT 16:15 ON MAY 26,2011 GH 5.89 FT SHIFT 0.12 FT

MAX GH: 5.89 FT AT 16:15 ON MAY 26,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08235270 WIGHTMAN FORK BELOW CROPSEY CREEK AT SUMMITVILLE
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08235290 WIGHTMAN FORK AT MOUTH NEAR JASPER
Water Year 2011

Location.-- Lat. $37^{\circ}24'14''$, Long. $106^{\circ}31'16''$, in SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 35, T.37 N., R.4 E., Rio Grande County, Hydrologic Unit 13010002, on right bank 25' downstream from bridge on Forest Development Road No. 250, about 300' upstream from confluence with Alamosa River, and 4.3 mi southwest of Jasper.

Drainage Area and Period of Record.-- 16.1 mi 2 . July 1995 to current year (seasonal record only).

Equipment.-- Shelter is 4 ft x 4 ft x 8 ft steel building. Contact with stream to determine water levels is by use of Sutron Accubar. Equipment includes Hydrolab to obtain water quality information. Data is stored in Sutron Satlink2 and transmitted to satellite. The primary reference gage is outside staff gage. Sutron Satlink2 installed May 1, 2011.

Hydrologic Conditions.-- Alpine and subalpine National Forest, also large area of reclaimed open pit mine. Flows influenced by water treatment plant operations at open pit mine.

Gage-Height Record.-- Primary record is 15-minute transmitted data with Satlink2 log as backup. Record is complete and reliable for the period of operation, Oct. 1-31 2010, May 1 to Sep. 30, 2011, except for Oct. 31, 2010 when there was missing satellite data, and May 1-6, 2011 when orifice line for pressure transducer was frozen, and May 29 - Jun. 24, Jul. 11-17, 2011 when the PVC pipe that houses the orifice line was buried isolating the pressure transducer during parts of the day. The stage-discharge relation was affected by ice Oct. 26-30, 2010. Two large flush/purge corrections were distributed during the periods when the pressure transducer orifice was isolated to aid in estimating the flows. A -0.02 ft pressure transducer correction on May 21, and a +0.02 ft pressure transducer correction on Jul. 17, 2011 were prorated from the previous visits. An erroneous -0.01 ft correction was made on Aug. 27 and then corrected +0.01 ft after measurement, so a +0.01 ft correction was applied to four unit values during measurement on this day.

Datum Corrections.-- Levels were not run this water year.

Rating.-- Control is a cobble stream channel and banks. Rating No. 6 was used from Oct. 1-31, 2010. Rating No. 7-2 was developed using measurements made during the 2011 water year and used from May 1 to Sep. 30, 2011. Nine discharge measurements (Nos. 68-76) were made during the water year ranging from 1.66 to 196 cfs. Measurements covered the daily mean discharge range encountered. The peak flow of 299 cfs occurred at 1645 on May 28, 2011 at a gage height of 4.97 feet with a shift of 0 feet. It exceeded high measurement No. 71, made May 29, 2011 (GH = 4.76 ft) by 0.21 feet in stage.

Discharge.-- Shifting-control method was used for the period of record. Shifts were applied as defined by measurements and distributed by time. The shift for the measurement made while using rating No. 6 was -0.26 ft. Measurement shifts ranged from -0.02 to +0.10 while using rating No. 7-2. All measurements were given full weight except for No. 70 and 76 which were adjusted as much as 6% to smooth shift distribution.

Special Computations.-- Discharge for periods of missing and ice affected record were estimated using temperature records, partial day good record and good record before and after affected periods. Two large flush corrections were distributed to assist in estimation during the periods when the pressure transducer orifice was isolated.

Remarks.-- Record is good, except for ice affected periods and periods of missing and unreliable data, which are estimated and poor. The peak flow and gage height data should be considered poor due to the very short duration of the peak event, possibly caused by debris washing through section. Station maintained and record developed by private consultant; record reviewed by Div 3 personnel.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08235290 WIGHTMAN FORK AT MOUTH NEAR JASPER

RATING TABLE-- WFKMOUCO06 USED FROM 01-OCT-2010 TO 31-OCT-2010
WFKMOUC07-2 USED FROM 01-MAY-2011 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.5	---	---	---	---	---	---	e10	e141	10	6.7	2.9
2	2.4	---	---	---	---	---	---	e10	e167	8.7	8.7	2.6
3	2.3	---	---	---	---	---	---	e12	e136	8.1	8.9	3.0
4	2.3	---	---	---	---	---	---	e14	e129	6.9	9.1	3.1
5	1.9	---	---	---	---	---	---	e16	e129	6.0	8.4	3.2
6	2.0	---	---	---	---	---	---	e18	e133	5.8	6.7	3.0
7	2.6	---	---	---	---	---	---	26	e112	5.9	6.1	3.2
8	3.8	---	---	---	---	---	---	41	e99	6.0	5.7	4.0
9	3.8	---	---	---	---	---	---	37	e92	5.4	5.4	5.4
10	3.2	---	---	---	---	---	---	27	e86	5.1	5.3	4.0
11	2.5	---	---	---	---	---	---	28	e82	e11	5.2	2.5
12	2.4	---	---	---	---	---	---	22	e71	e11	5.2	2.3
13	2.5	---	---	---	---	---	---	35	e64	e6.8	5.3	3.4
14	2.0	---	---	---	---	---	---	62	e60	e6.5	5.8	4.2
15	2.1	---	---	---	---	---	---	84	e59	e6.4	5.4	4.7
16	2.1	---	---	---	---	---	---	111	e55	e7.3	4.4	5.0
17	2.0	---	---	---	---	---	---	94	e49	e7.0	4.4	6.2
18	2.0	---	---	---	---	---	---	65	e42	7.6	4.4	5.3
19	1.8	---	---	---	---	---	---	44	e37	7.7	4.5	4.0
20	1.8	---	---	---	---	---	---	32	e35	8.7	4.8	3.4
21	2.0	---	---	---	---	---	---	32	e30	9.2	4.6	3.2
22	2.2	---	---	---	---	---	---	49	e29	7.5	5.4	2.9
23	2.2	---	---	---	---	---	---	69	e28	7.1	4.6	2.5
24	2.4	---	---	---	---	---	---	64	e26	6.4	2.8	3.5
25	2.6	---	---	---	---	---	---	63	23	7.3	3.2	3.6
26	e2.6	---	---	---	---	---	---	100	19	7.3	4.8	3.6
27	e2.5	---	---	---	---	---	---	127	16	8.1	7.6	2.9
28	e2.5	---	---	---	---	---	---	168	13	7.1	5.1	3.5
29	e2.4	---	---	---	---	---	---	e173	12	6.9	5.4	2.9
30	e2.5	---	---	---	---	---	---	e104	13	7.5	5.8	3.2
31	e2.5	---	---	---	---	---	---	e87	---	7.7	3.5	---
TOTAL	74.4	---	---	---	---	---	---	1824	1987	230.0	173.2	107.2
MEAN	2.40	---	---	---	---	---	---	58.8	66.2	7.42	5.59	3.57
AC-FT	148	---	---	---	---	---	---	3620	3940	456	344	213
MAX	3.8	---	---	---	---	---	---	173	167	11	9.1	6.2
MIN	1.8	---	---	---	---	---	---	10	12	5.1	2.8	2.3

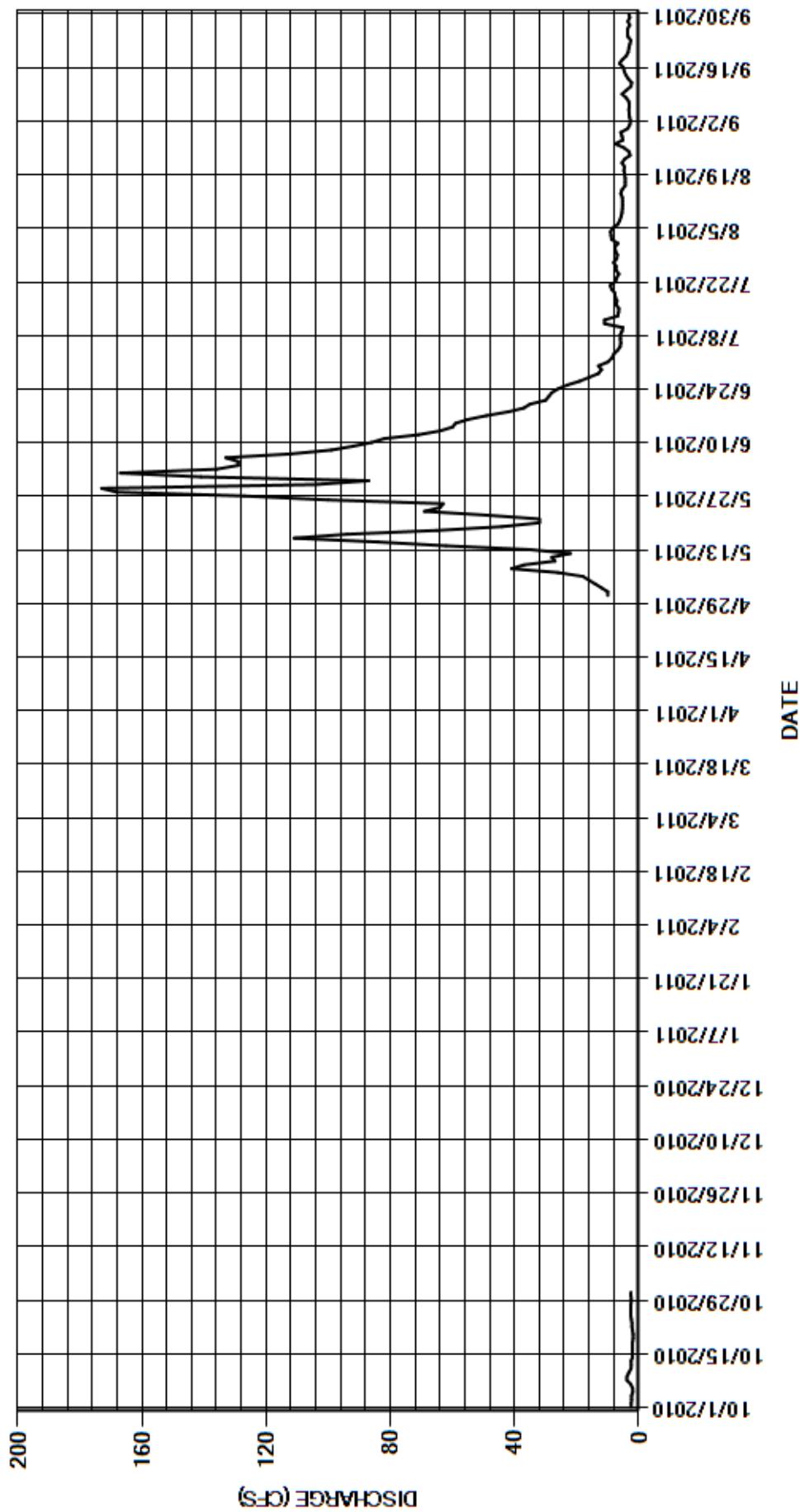
CAL YR	2010	TOTAL	5174.8	MEAN	28.1	MAX	256	MIN	1.8	AC-FT	10260	(PARTIAL YEAR RECORD)
WTR YR	2011	TOTAL	4395.8	MEAN	23.9	MAX	173	MIN	1.8	AC-FT	8720	(PARTIAL YEAR RECORD)

MAX DISCH: 299 CFS AT 16:45 ON MAY 28,2011 GH 4.97 FT SHIFT 0 FT

MAX GH: 4.97 FT AT 16:45 ON MAY 28,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08235290 WIGHTMAN FORK AT MOUTH NEAR JASPER
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
ALAMOSA RIVER BELOW RANGER CREEK NEAR JASPER
Water Year 2011

Location.--	Lat 37° 23' 23", long 106° 22' 43" referenced to North American Datum of 1983 (Jasper, CO quad, scale 1:24,000), UTM Zone 13 377962 E and 4138995 N, in SW ¼ NE ¼ sec. 11, T.36 N., R.5 E., New Mexico Principal Meridian, Conejos County, CO, Hydrologic Unit 13010002, on right bank 30 ft above Silver Lakes Road Bridge, 0.4 mi below Ranger Creek and 4 mi above Terrace Reservoir.
Drainage Area and Period of Record.--	Not determined. 2003 to current year.
Equipment.--	Shelter is 4 ft x 4 ft x 8 ft steel building equipped with Sutron Accubar to collect stream level data and Hydrolab to collect water quality information. Sutron Satlink2 used to store collected data and transmit to satellite. Outside staff gage installed as base reference gage.
Hydrologic Conditions.--	Undeveloped steep alpine and subalpine terrain.
Gage-Height Record.--	Primary record is 15-minute transmitted data with Satlink2 log as backup. Record is complete and reliable for the period of operation, Oct. 1 to Oct. 31, 2010 and May 1 to Sep. 30, 2011, except for Oct. 31, 2010, and May 1 - 6, 2011, when there was missing data due to station being closed for part of the day or the orifice line being frozen; and May 14 - 21, Jun. 23, 24, 2011 when the orifice line and PVC pipe around the orifice line were buried in sand and silt isolating the gage. The stage-discharge relation was affected by ice Oct. 27-30, 2010. There were three pressure transducer corrections applied. One from Jun. 23 to Jun. 24 of -0.14 ft, which was applied based on the appearance of the GH record and by comparison with the flows from the Alamosa River above Terrace Reservoir gage. A -0.07 ft correction was prorated from Jun. 24 to Jul. 5 when silt had built up around the pressure transducer orifice but apparently flushed away based on rapid changes in GH record and by comparison with the flows from the Alamosa River above Terrace Reservoir gage . The third pressure transducer correction of -0.02 ft was prorated from Jul. 5 until Jul. 16, 2011.
Datum Corrections.--	Levels were not run at this station this year.
Rating.--	Control is primarily stream channel of rock and earthen banks. Bridge on downstream side of gage is also part of the control. Channel is stable at low and medium flows, but can change at very high flows. Stream is covered by ice during winter months. Rating No. 5_1 was used for this year's period of record. It was developed using recent discharge measurements and the Aquarius rating table development software. Eight discharge measurements (Nos. 70-77) were made during period of record for this water year ranging in discharge from 21.0 to 684 cfs. Measurements cover the range encountered except for the lower daily flows on Oct. 18–20, 26–31, 2010. The peak flow of 755 cfs occurred at 2245 on June 6, 2011 at a gage height of 4.92 ft. with a shift of 0.04 ft. It exceeded high measurement No. 73 (GH=4.67 ft), made May 29, 2011 by 0.25 feet in stage. Measurement No. 73, measured shift (+0.13) was adjusted to (+0.04) based on historic high flow measurements and by hydrographic comparison with the flows at Alamosa above Terrace Reservoir gage.
Discharge.--	Shifts were applied by time for the period of record from May 1-21, 2011. Shifts were applied according to stage for the remainder of the period of record using two shift curves; ALARANCOVS1103, Oct. 1–31, 2010, ALARANCOVS1108, May 21 – Sep. 30, 2011. Measurement shifts ranged from -0.09 to +0.14 feet. All measurements were given full weight and applied except No's. 73, 74, and 76 which were rated fair and adjusted as much as 8% to fit shift curve. The stage discharge relationship was affected by ice Oct. 26-30, 2010.
Special Computations.--	Discharge for periods of no gage-height and ice affected record was estimated using hydrographic comparison with Alamosa River above Terrace Reservoir gaging station and measurements.
Remarks.--	The plotted gage-height record indicates that the Accubar pressure sensor continuously 'hunts' the point of pressure equilibrium. This hunting creates some uncertainty in gage-height record. Due to this uncertainty, the record should be considered fair except for periods of no gage-height and ice affected record, which are estimated and poor. Station maintained and record developed by private consultant; record reviewed by Div 3 hydrographic staff.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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ALAMOSA RIVER BELOW RANGER CREEK NEAR JASPER

RATING TABLE-- ALARANCO05_1 USED FROM 01-OCT-2010 TO 30-SEP-2011

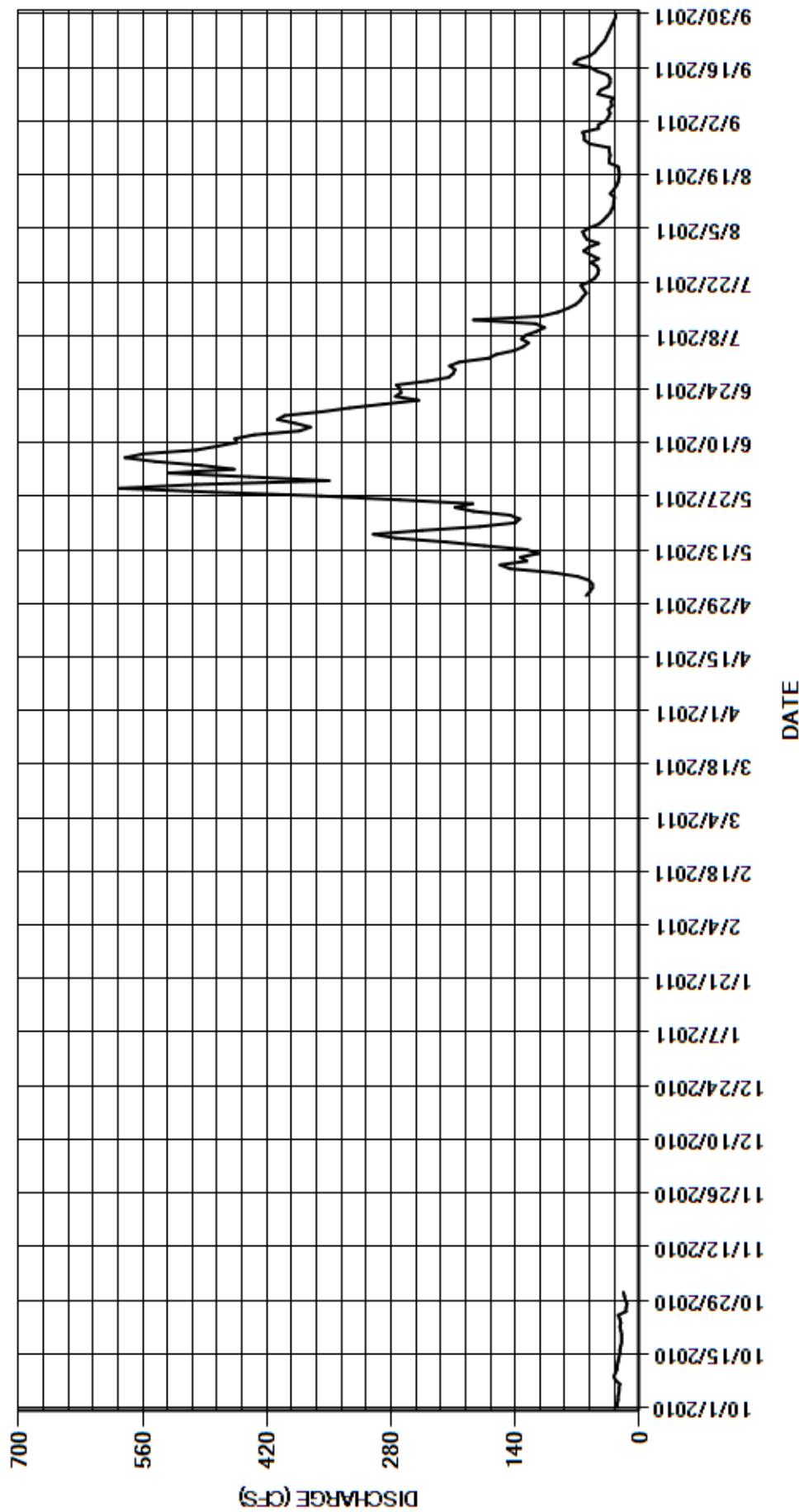
DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011												
DAY	MEAN VALUES											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	25	---	---	---	---	---	---	e60	440	203	46	46
2	25	---	---	---	---	---	---	e56	531	170	59	38
3	24	---	---	---	---	---	---	e53	457	161	62	35
4	24	---	---	---	---	---	---	e53	494	141	64	33
5	23	---	---	---	---	---	---	e57	546	131	57	35
6	23	---	---	---	---	---	---	e70	580	125	46	31
7	22	---	---	---	---	---	---	98	560	133	41	32
8	27	---	---	---	---	---	---	146	500	128	37	30
9	29	---	---	---	---	---	---	157	476	116	33	47
10	27	---	---	---	---	---	---	127	454	107	31	44
11	25	---	---	---	---	---	---	134	456	117	29	35
12	25	---	---	---	---	---	---	114	434	187	29	33
13	24	---	---	---	---	---	---	127	383	110	28	33
14	23	---	---	---	---	---	---	e175	371	92	33	36
15	22	---	---	---	---	---	---	e218	388	81	29	48
16	22	---	---	---	---	---	---	e275	408	72	26	56
17	21	---	---	---	---	---	---	e300	400	67	24	74
18	20	---	---	---	---	---	---	e245	358	64	23	69
19	20	---	---	---	---	---	---	e180	327	60	23	56
20	20	---	---	---	---	---	---	e140	288	63	23	50
21	21	---	---	---	---	---	---	e135	249	66	24	47
22	22	---	---	---	---	---	---	146	275	56	34	43
23	21	---	---	---	---	---	---	187	e269	50	34	39
24	22	---	---	---	---	---	---	208	e270	47	33	37
25	24	---	---	---	---	---	---	188	274	46	34	35
26	15	---	---	---	---	---	---	270	239	48	34	33
27	e15	---	---	---	---	---	---	359	215	55	56	31
28	e14	---	---	---	---	---	---	482	210	46	62	29
29	e16	---	---	---	---	---	---	586	208	55	62	27
30	e17	---	---	---	---	---	---	500	214	63	64	27
31	e18	---	---	---	---	---	---	350	---	57	46	---
TOTAL	676	---	---	---	---	---	---	6196	11274	2917	1226	1209
MEAN	21.8	---	---	---	---	---	---	200	376	94.1	39.5	40.3
AC-FT	1340	---	---	---	---	---	---	12290	22360	5790	2430	2400
MAX	29	---	---	---	---	---	---	586	580	203	64	74
MIN	14	---	---	---	---	---	---	53	208	46	23	27
CAL YR	2010	TOTAL	27959	MEAN	152	MAX	863	MIN	14	AC-FT	55460 (PARTIAL YEAR RECORD)	
WTR YR	2011	TOTAL	23498	MEAN	128	MAX	586	MIN	14	AC-FT	46610 (PARTIAL YEAR RECORD)	

MAX DISCH: 755 CFS AT 22:45 ON JUN 06,2011 GH 4.92 FT SHIFT 0.04 FT

MAX GH: 4.92 FT AT 22:45 ON JUN 06,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ALAMOSA RIVER BELOW RANGER CREEK NEAR JASPER
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08236000 ALAMOSA RIVER ABOVE TERRACE RESERVOIR
Water Year 2011

Location.--	Lat 37° 22' 28", long 106° 19' 57" referenced to North American Datum of 1983 (Terrace Reservoir, CO quad, scale 1:24,000), UTM Zone 13 382021 E and 4137254 N, in NE ¼ NE ¼ sec. 17, T.36 N., R.6 E., New Mexico Principal Meridian, Conejos County, CO, Hydrologic Unit 13010002, on left bank 0.8 mi upstream from high-water line of Terrace Reservoir, 3.0 mi downstream from French Creek, and 15 mi northwest of Capulin.
Drainage Area and Period of Record.--	107 mi ² (from topographic maps). Sept. 29, 1911 to June 4, 1912, Apr. 25, 1914 to Sept. 30, 1927, Oct. 1, 1934 to current year.
Equipment.--	Sutron Satlink2 , a float-operated SDR, and air temperature sensor in a 4-ft diameter metal shelter and well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. Cableway located 10 feet below gaging station. On May 10, 2011 the Stevens A-35 Recorder and a Sutron 8210 HDR Data Collection Platform were removed from the gage.
Hydrologic Conditions.--	Undeveloped steep alpine and subalpine terrain.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup until May 10, 2011. After May 10, DCP log and SDR log as backup. Record is complete and reliable except Nov. 24, 2010 until March 14, 2011 when the station was closed for the winter, and Sep. 29 and 30, 2011 when equipment was working in gage pool. Stage-discharge relation was affected by ice Oct. 27, 28, Nov. 10-23, 2010, March 23-26, 2011. There were two instrument corrections made to the shaft encoder, -0.01 and +0.01 feet. These corrections were prorated by time from previous visit. Nine unit values were filled in May 10, 2011 while equipment was being upgraded. Two 15-minute values were filled from the DCP log and the remaining seven unit values were estimated using linear interpolation without loss of accuracy.
Datum Corrections.--	Levels were run Sep. 9, 2011 to the Reference Point (RP) inside the gage using BM #1 as base. The RP elevation was found to be within allowable limits, so a correction was not required or made. A two-peg test was performed on the Lietz level (SN 130869) on Sep. 26, 2011, level found to be out of tolerances and slightly adjusted.
Rating.--	Control is a cobblestone riffle approximately fifty feet below the gage. Rating No. 17 was used again this year. The rating is fairly well defined from 5 cfs to approximately 1300 cfs. Seventeen measurements (Nos. 200-216) were made this year ranging in discharge from 8.49 to 492 cfs. The measurements cover the discharge range experienced except for the higher daily flows on May 28-30, and June 2, 4-9, 2011. The peak flow of 779 cfs occurred at 2330 on June 6, 2011 at a gage height of 2.85 ft. with a shift of 0.02 ft. The peak exceeded high measurement No. 211 (GH=2.39 ft) made on June 6, 2011 by 0.46 ft in stage.
Discharge.--	Shifting control method was used for all open water periods. Shifts were applied as defined by measurements and prorated by time. Open water measurement shifts ranged from -0.06 to +0.02 ft. All were given full weight except Nos. 209, 210, and 213, which were adjusted by as much as 3% to smooth shifts between measurements. Measurement Nos. 200 and 212 were rated fair and adjusted as much as 6%. Stage-discharge relation was affected by ice and discharge estimated on Oct. 27, 28, Nov. 10-23, 2010, March 23-26, 2011.
Special Computations.--	Discharge for periods of no gage-height and ice affected record were estimated using measurements, weather records, partial day record, and comparison with Terrace Reservoir gain and outflow. Equipment was in the river moving material from the gage pool and control on Sep. 29 and 30, 2011.
Remarks.--	Record is good, except for periods of no gage-height, ice-affected record, and Sep. 29 and 30, 2011 when equipment was in the river, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	Obtain measurements throughout the gage height range of next water year to develop a new rating.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08236000 ALAMOSA RIVER ABOVE TERRACE RESERVOIR

RATING TABLE-- ALATERCO17 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

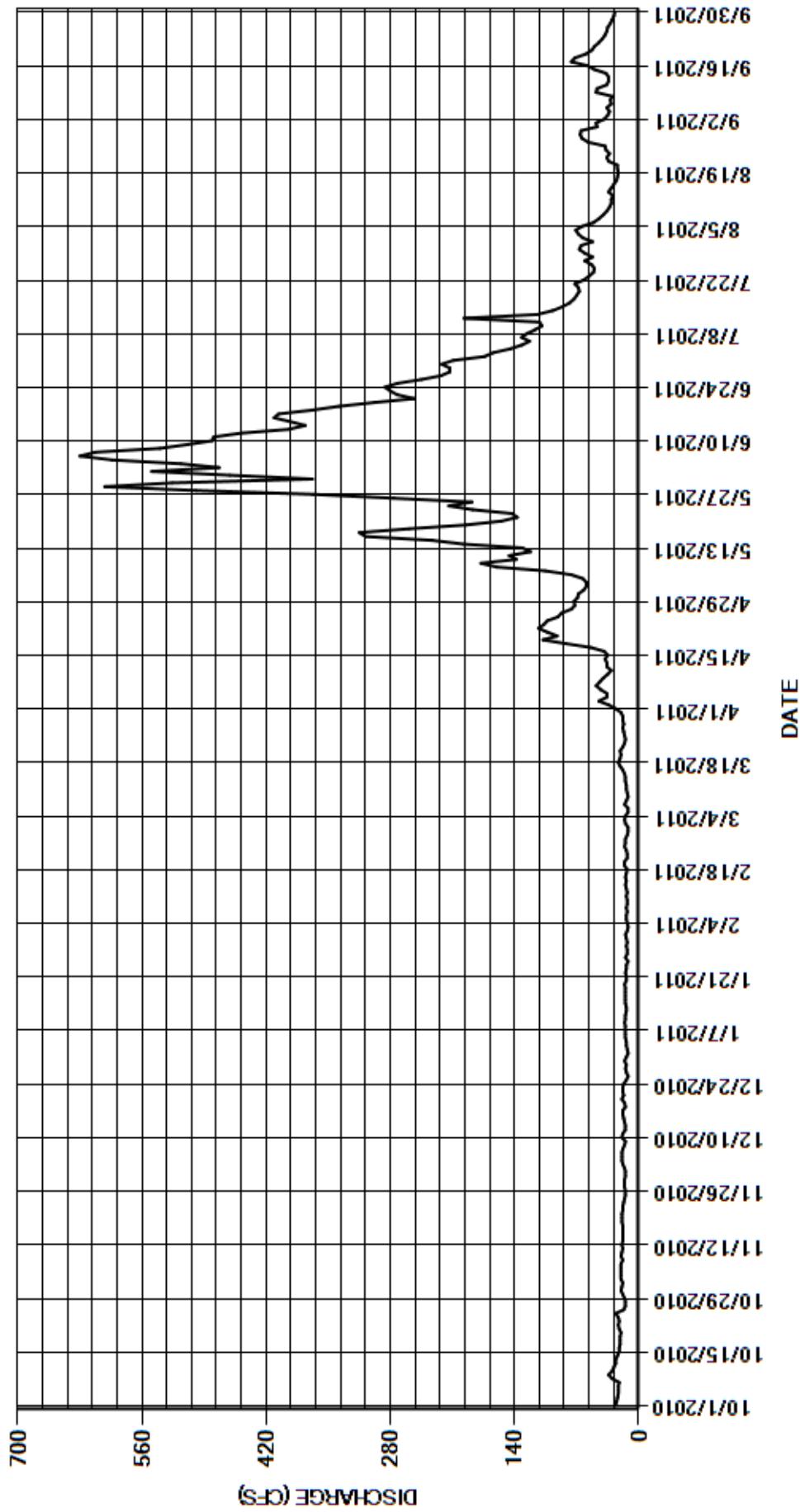
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	26	19	e15	e12	e15	e12	26	68	461	209	52	48
2	25	18	e16	e13	e13	e15	34	62	549	174	63	39
3	24	20	e18	e14	e12	e16	45	59	473	164	68	35
4	23	20	e19	e14	e13	e15	36	59	516	145	71	33
5	23	20	e19	e15	e14	e12	36	63	594	132	64	36
6	23	20	e19	e15	e14	e12	43	76	630	123	51	31
7	22	20	e18	e15	e13	e16	48	105	613	132	45	32
8	30	18	e16	e15	e14	e14	44	160	540	126	40	30
9	34	20	e15	e16	e13	e12	40	178	509	117	36	48
10	30	e19	e19	e15	e13	e13	35	138	481	109	33	47
11	28	e18	e18	e15	e14	e14	31	146	479	112	31	36
12	26	e19	e15	e14	e13	e14	36	122	448	197	31	34
13	26	e18	e15	e14	e14	e15	36	131	394	114	29	34
14	24	e18	e16	e15	e15	e15	38	197	376	97	34	37
15	22	e18	e17	e15	e14	16	35	233	393	86	31	50
16	22	e18	e18	e15	e15	18	39	308	411	78	28	58
17	21	e18	e18	e15	e14	21	54	315	406	73	25	76
18	21	e19	e15	e15	e13	23	82	259	368	70	24	72
19	21	e19	e16	e16	e16	21	108	195	338	67	23	60
20	20	e19	e19	e14	e16	20	92	155	298	68	24	53
21	22	e18	e17	e14	e13	21	103	137	253	72	24	50
22	23	e18	e18	e15	e13	18	113	143	272	62	34	45
23	22	e17	e18	e14	e14	e16	107	187	280	56	36	41
24	23	e16	e17	e14	e16	e15	103	214	286	51	33	38
25	26	e15	e14	e12	e15	e16	91	188	272	50	37	36
26	17	e15	e12	e15	e15	e17	87	276	245	53	38	35
27	e15	e16	e14	e13	e13	18	76	367	223	61	57	32
28	e15	e16	e15	e13	e12	17	72	499	213	52	64	30
29	16	e16	e14	e14	---	18	73	602	213	61	66	e28
30	18	e15	e16	e13	---	18	69	526	222	67	65	e27
31	20	---	e14	e14	---	20	---	368	---	65	47	---
TOTAL	708	540	510	443	389	508	1832	6536	11756	3043	1304	1251
MEAN	22.8	18.0	16.5	14.3	13.9	16.4	61.1	211	392	98.2	42.1	41.7
AC-FT	1400	1070	1010	879	772	1010	3630	12960	23320	6040	2590	2480
MAX	34	20	19	16	16	23	113	602	630	209	71	76
MIN	15	15	12	12	12	12	26	59	213	50	23	27
CAL YR	2010	TOTAL	34157	MEAN	93.6	MAX	891	MIN	12	AC-FT	67750	
WTR YR	2011	TOTAL	28820	MEAN	79.0	MAX	630	MIN	12	AC-FT	57160	

MAX DISCH: 779 CFS AT 23:30 ON JUN 06,2011 GH 2.85 FT SHIFT 0.02 FT

MAX GH: 2.85 FT AT 23:30 ON JUN 06,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08236000 ALAMOSA RIVER ABOVE TERRACE RESERVOIR
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08236500 ALAMOSA RIVER BELOW TERRACE RESERVOIR
Water Year 2011

Location.--	Lat 37° 21' 14", long 106° 16' 42" referenced to North American Datum of 1983 (Terrace Reservoir, CO quad, scale 1:24,000), UTM Zone 13 386788 E and 4134887 N, in NE ¼ SE ¼ sec. 23, T.36 N., R.6 E., New Mexico Principal Meridian, Conejos County, CO, Hydrologic Unit 13010002, on left bank 0.5 mi downstream from Terrace Reservoir, 11.0 mi northwest of Capulin, CO.
Drainage Area and Period of Record.--	116 mi ² , approximately (from topographic maps). 1909-1915, 1917-1928 (partial year records on many years), 1929 to current year.
Equipment.--	Graphic water stage recorder, data collection platform (Sutron Model Satlink Logger) and a float-operated shaft encoder in a 6-foot square concrete aggregate shelter and 3 ft diameter concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. A bank-operated cableway is located 100 feet downstream. No change.
Hydrologic Conditions.--	Flow at gage is completely regulated by Terrace Reservoir.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Dec. 29, 2010 to Mar. 7, 2011 when the well was frozen. A +0.01 instrument correction was made on Oct. 7, 2010 and was prorated by time from previous visit.
Datum Corrections.--	Levels were run Sep. 9, 2011 to the Reference Point (RP) inside the gage using BM #1 as base. The RP elevation was found to be 0.03 ft low. Therefore a +0.03 ft correction was made to the RP resulting in a -0.03 ft datum correction being applied to the gage height record and applied back to March 7, 2011 when the well was opened. Two-peg tests were performed on the Lietz level (SN 130869) on May 27, Jul. 28, and Sept. 26, 2011. The first two tests showed instrument was within tolerance, but a small adjustment was made on Sep. 26.
Rating.--	Control is a gravel and cobblestone riffle approximately one hundred fifty feet below the gage. Rating No. 14 was used again this year. This rating was developed from measurements made during the 2010 water year and high flow measurements since the gage was re-located to the current location in 1988. Recent measurements were given more weight which causes this rating to curve slightly to the right as compared with Rating 13 at the upper end. Measurements used range in flow from 1.36 to 951 cfs and range in stage from 1.94 ft to 4.70 ft. The highest measurement at this site since 1988 was measured 5/25/2005 and was used directly to create rating 14. The pzf measured on November 9, 2009, 1.74 ft, was used to define the low point (this same value was measured previously December 4, 2008. The pzf is 0.20 ft greater than rating 13 which indicates filling has occurred in the gage pool. Rating 14 has 10 definition points, 1 breakpoint, and 2 offsets. The high end offset is 2.89 ft which was determined from the best fit offset with some modification to give more weight to recent measurements. The point where the control goes from section to channel control was used for the breakpoint, this occurs at approximately 3.83 ft as determined from measurement notes and observation of best fit. Other definition points were added to smooth the rating curve and prevent reversals from occurring. Rating 14 was extended above the high flow measurement by 0.64 ft to a flow of 1660 cfs at 5.34 ft, 75 percent greater than the highest measurement at this site since 1988. The rating is fairly well defined from 1 to 1000 cfs. Eighteen measurements (Nos. 161-178) were made this year ranging in discharge from 1.54 to 601 cfs. They cover the discharge range experienced except for higher daily flows May 30, Jun. 7, 8, 2011. The peak flow of 770 cfs occurred at 0800 on May 29, 2011 at a gage height of 4.45 ft (with -0.03 ft datum correction applied) and a shift of +0.05 ft. It exceeded high measurement No. 173 (GH = 4.18), made June 6, 2011, by 0.27 ft in stage.
Discharge.--	Shifting control method was used during all open water periods. Shifts were applied as defined by measurements and prorated by time. Measurement shifts ranged from -0.02 to +0.07 ft. All were given full weight and applied except Nos. 162, 168, 172, 174, 176, and 178 which were adjusted as much as 4% and Nos. 169 and 175 were rated fair and adjusted by 8%.
Special Computations.--	Discharge for periods of no gage-height record was estimated using measurements, partial day records, temperature records, and Terrace Reservoir storage elevation.
Remarks.--	Record is good except for the period of no gage-height record, which is estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	

STATE OF COLORADO
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08236500 ALAMOSA RIVER BELOW TERRACE RESERVOIR

RATING TABLE-- ALABELCO14 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

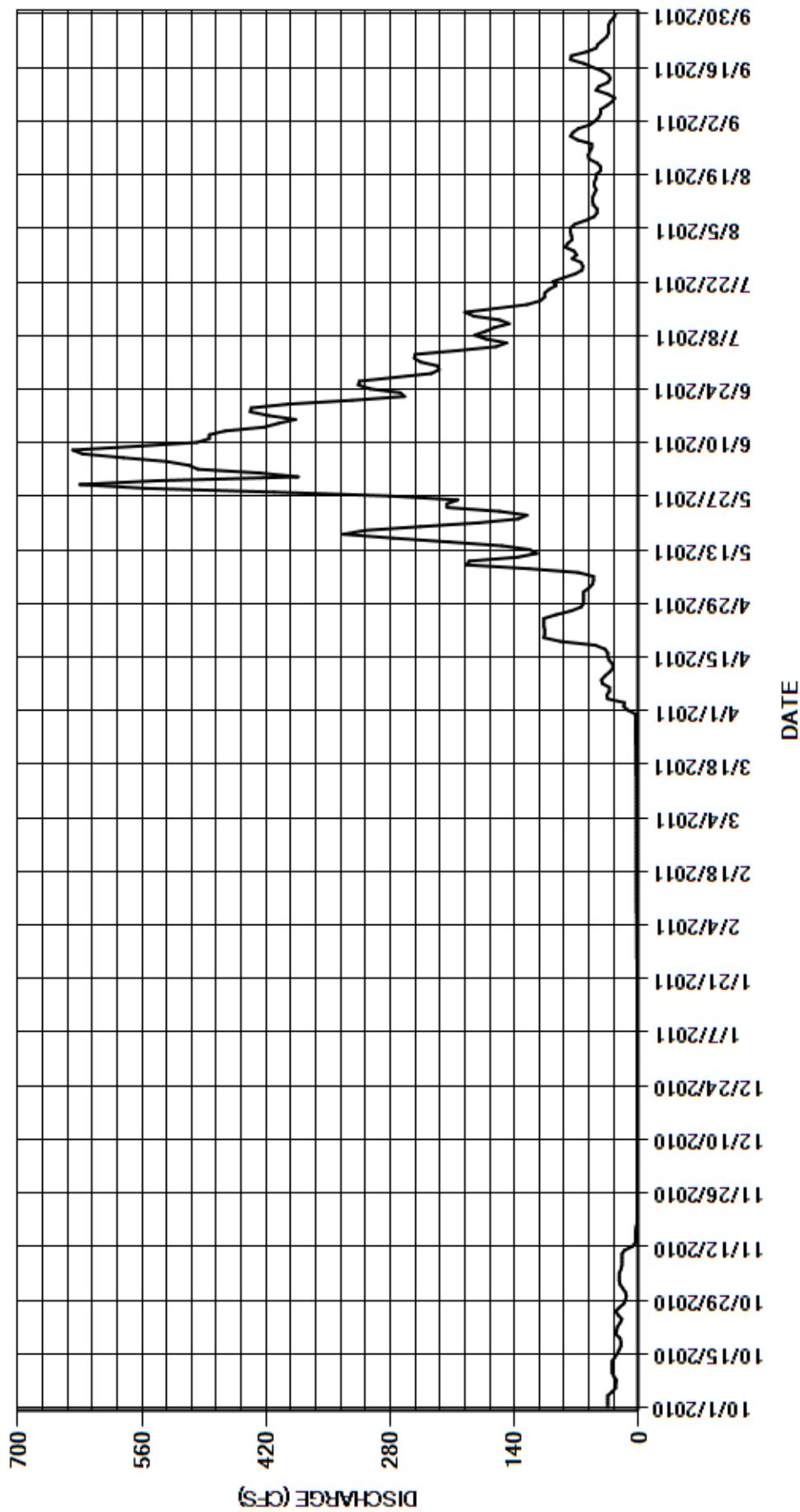
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	35	18	1.9	e1.6	e2.2	e2.8	12	62	384	246	80	55
2	35	21	1.9	e1.6	e2.2	e2.8	17	62	427	253	75	49
3	35	22	1.9	e1.6	e2.2	e2.8	16	56	497	252	76	45
4	35	22	1.9	e1.6	e2.2	e2.8	35	52	507	204	77	43
5	30	22	1.8	e1.7	e2.3	e2.8	36	51	532	161	77	43
6	26	20	1.7	e1.7	e2.4	e2.8	33	51	581	149	72	36
7	26	19	1.7	e1.7	e2.5	e2.8	33	68	627	172	60	30
8	25	19	1.7	e1.7	e2.5	2.8	41	124	638	185	50	27
9	28	19	1.7	e1.8	e2.5	2.8	42	194	565	173	47	35
10	30	19	1.7	e1.8	e2.6	2.9	38	191	498	163	47	48
11	30	16	1.6	e1.8	e2.6	2.9	33	137	484	146	51	45
12	30	7.0	1.6	e1.8	e2.6	2.9	29	115	484	157	52	35
13	30	3.6	1.6	e1.8	e2.6	2.9	29	123	466	186	52	32
14	27	3.6	1.7	e1.9	e2.7	2.9	33	154	422	196	50	34
15	24	3.6	1.7	e1.9	e2.8	3.0	35	214	406	161	48	41
16	22	3.6	1.6	e1.9	e2.8	3.0	35	277	387	126	50	52
17	20	2.9	1.6	e1.9	e2.8	3.1	38	333	417	111	50	62
18	20	1.9	1.6	e1.9	e2.8	3.2	49	309	438	106	48	77
19	21	1.9	1.6	e1.9	e2.8	3.1	88	246	437	106	48	76
20	26	1.9	1.6	e1.9	e2.8	3.2	107	180	395	101	43	59
21	25	1.9	1.6	e2.0	e2.8	3.3	106	136	323	93	43	48
22	24	1.9	1.6	e2.0	e2.8	3.3	106	126	264	97	47	46
23	21	2.0	1.6	e2.0	e2.8	3.4	107	157	269	85	56	41
24	19	1.9	1.6	e2.0	e2.8	3.4	107	216	303	72	57	36
25	23	2.0	1.6	e2.0	e2.8	3.4	107	216	316	64	55	34
26	26	2.1	1.6	e2.1	e2.8	3.4	93	204	315	63	53	34
27	22	1.9	1.6	e2.1	e2.8	3.4	76	281	274	65	53	34
28	17	2.0	1.6	e2.2	e2.8	3.4	65	411	234	75	69	32
29	15	2.0	e1.6	e2.2	---	3.4	62	556	225	70	77	28
30	14	2.0	e1.6	e2.2	---	3.5	62	630	227	73	74	26
31	15	---	e1.6	e2.2	---	3.6	---	542	---	83	68	---
TOTAL	776	266.7	51.7	58.5	73.3	95.8	1670	6474	12342	4194	1805	1283
MEAN	25.0	8.89	1.67	1.89	2.62	3.09	55.7	209	411	135	58.2	42.8
AC-FT	1540	529	103	116	145	190	3310	12840	24480	8320	3580	2540
MAX	35	22	1.9	2.2	2.8	3.6	107	630	638	253	80	77
MIN	14	1.9	1.6	1.6	2.2	2.8	12	51	225	63	43	26
CAL YR	2010	TOTAL	35553.0	MEAN	97.4	MAX	913	MIN	1.6	AC-FT	70520	
WTR YR	2011	TOTAL	29090.0	MEAN	79.7	MAX	638	MIN	1.6	AC-FT	57700	

MAX DISCH: 770 CFS AT 08:00 ON MAY 29,2011 GH 4.45 FT SHIFT 0.05 FT

MAX GH: 4.45 FT AT 08:00 ON MAY 29,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08236500 ALAMOSA RIVER BELOW TERRACE RESERVOIR
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08238000 LAJARA CREEK AT GALLEGOS RANCH NEAR CAPULIN
Water Year 2011

Location.--	Lat 37°12'36", long 106°11'16" referenced to North American Datum of 1983 (Vicente Canyon, CO quad, scale 1:24,000), UTM Zone 13 394608 E and 4118841 N, in NW ¼ NE ¼ sec. 10, T.34 N., R.7 E., New Mexico Principal Meridian, Conejos County, CO, Hydrologic Unit 13010002, on left bank 2.7 mi downstream from Canyon Del Rancho, 7 mi southwest of Capulin, CO, and 16.5 mi downstream from La Jara Reservoir.
Drainage Area and Period of Record.--	98 mi ² . April 1916 to November 1917, April 1919 to Nov 1923, May 1936 to current year. No winter records prior to 1950 except water year 1944. Monthly discharge only for some periods.
Equipment.--	Sutron Satlink2 and float-operated SDR and a tipping-bucket rain gauge in a 42-inch diameter CMP shelter and well. The primary reference gage is a drop tape from reference point on shelf. A cantilever staff gage was installed at the site on May 5, 2011. Chart recorder removed when satellite equipment was upgraded on May 10, 2011.
Hydrologic Conditions.--	Basin predominately subalpine, undeveloped National Forest with flow somewhat regulated by La Jara Reservoir (capacity 14,040 acre-ft) 16 1/2 mi upstream. Small diversions above station for irrigation.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup until May 10, 2011 when satellite equipment was upgraded and chart recorder removed. Record is complete and reliable except for Nov. 24, 2010 through Mar. 7, 2011 when station was closed for the winter. Eleven unit values were estimated on May 10, 2011 while equipment was being upgraded. The stage-discharge relation was affected by ice Oct. 27-30, Nov. 10-23, 2010 and Mar. 8-14, 23-26, Apr. 4, 5, 2011. A +0.02 ft datum correction was applied to the record from March 7 – September 9, 2011. Two -0.01 ft shaft encoder corrections were made and both were prorated from previous visit.
Datum Corrections.--	Levels were run to the Reference Point (RP) inside the gage using BM #1 as base on Sep.9, 2011. The RP elevation was found to be 0.02 ft high, so the RP was lowered by 0.02 ft. Therefore a +0.02 ft correction was applied to the record and carried back to when the gage was opened on March 7, 2011. Two-peg tests were performed on the instrument on May 27, Jul. 28, and Sep. 26, 2011. The instrument was adjusted slightly on Sep. 26, 2011.
Rating.--	The control is a concrete broad crested weir with a v-notch cut into its center, approximately 15 feet below the gage. Minor shifting occurs mainly due to scour and fill in and above gage pool. Rating No. 19TMP, in use since October 1, 2004, was used again this year. It is well defined from 1.7 to 142 cfs. Fifteen measurements (Nos. 161-175) were made this year ranging in discharge from 3.44 to 23 cfs. They cover the discharge range experienced. The peak flow of 27.3 cfs occurred at 0500 on May 4, 2011 at a gage height of 1.43 feet (+0.02 ft datum correction and -0.01 ft instrument correction applied) with a shift of -0.04 feet. The peak exceeded high measurement No. 69 (GH=1.36 feet), made Apr. 26, 2011 by 0.07 feet in stage.
Discharge.--	Shifting-control method was used for all periods of good record. The stage-discharge relation was affected by ice and discharge estimated Oct. 27-30, Nov. 10-23, 2010 and Mar. 8-14, 23-26, Apr. 4, 5, 2011. A shift curve was used from Apr. 6 to May 27 to redefine the rating during higher water. During other periods, shifts were defined by measurements and distributed by time. Measured shifts range from -0.04 feet to +0.04 ft. All measurements were given full weight except for Nos. 161, 167, 170, and 173 which were adjusted as much as 5% to smooth shift distribution.
Special Computations.--	Discharge for periods of no gage-height and ice affected record was estimated using discharge measurements, hydrographic comparison with Alamosa River above Terrace Reservoir, and temperature records from Alamosa River above Terrace Reservoir.
Remarks.--	Record is good, except for periods of no gage-height and ice affected record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08238000 LAJARA CREEK AT GALLEGOS RANCH NEAR CAPULIN

RATING TABLE-- LAJCAPCO19TMP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.8	7.4	e6.0	e4.8	e4.6	e6.0	14	17	9.8	5.2	6.0	5.9
2	8.1	7.0	e6.0	e4.9	e4.4	e6.4	15	16	9.4	5.1	6.8	5.9
3	8.3	7.7	e6.4	e5.0	e4.4	e6.8	17	18	9.2	5.8	6.6	5.9
4	8.1	7.5	e6.4	e5.1	e4.6	e6.8	e11	23	9.6	6.6	6.1	6.4
5	8.2	7.4	e6.4	e5.2	e4.6	e7.0	e10	19	9.3	5.9	6.7	7.0
6	8.4	7.4	e6.4	e5.2	e4.6	e8.0	11	16	9.3	6.3	5.9	6.4
7	8.3	7.6	e6.0	e5.2	e4.7	e8.0	13	16	8.9	5.8	5.6	6.7
8	8.3	7.3	e5.6	e5.2	e4.7	e8.0	13	18	8.6	4.9	5.2	6.8
9	8.4	7.6	e6.0	e5.4	e4.8	e7.8	12	19	8.6	4.2	5.1	11
10	8.4	e7.0	e6.0	e5.2	e4.8	e7.8	11	18	8.4	4.8	5.0	8.1
11	8.4	e6.4	e5.6	e5.0	e5.0	e8.0	10	18	8.3	4.8	5.0	7.1
12	7.9	e6.4	e5.4	e5.0	e5.2	e8.0	11	18	8.2	6.0	5.2	6.7
13	7.2	e6.8	e5.4	e4.8	e5.4	e8.0	11	16	8.1	5.2	5.2	6.6
14	7.0	e6.8	e5.8	e4.8	e5.4	e9.0	11	17	7.4	5.3	5.6	7.1
15	6.9	e7.0	e6.2	e4.8	e6.4	8.8	9.9	18	7.0	5.2	5.6	7.8
16	6.9	e7.0	e5.8	e4.8	e7.0	8.9	10	17	6.8	4.7	5.6	8.0
17	6.9	e7.0	e5.4	e4.8	e7.0	9.9	11	16	6.6	4.1	5.3	8.2
18	7.2	e7.4	e5.4	e4.8	e6.6	11	12	15	6.6	4.4	5.1	7.5
19	7.4	e7.4	e5.8	e5.0	e6.6	10	17	17	6.6	4.8	5.4	6.9
20	7.4	e7.0	e6.4	e4.6	e6.2	11	18	17	6.9	5.4	5.6	6.6
21	7.8	e7.0	e6.8	e4.6	e6.0	13	17	16	7.1	6.2	6.5	6.5
22	8.1	e6.4	e6.8	e4.4	e6.0	11	18	15	6.5	6.8	8.2	6.3
23	7.8	e6.4	e6.4	e4.3	e6.0	e8.6	17	14	6.0	5.8	7.0	6.3
24	7.6	e6.0	e6.2	e4.2	e6.0	e9.0	19	14	5.7	5.5	6.5	6.2
25	7.9	e5.6	e6.0	e4.0	e6.0	e8.0	20	13	5.6	5.2	6.7	6.2
26	8.0	e6.0	e5.8	e4.0	e5.8	e8.4	22	12	5.7	5.5	7.2	6.2
27	e7.8	e6.2	e5.6	e4.1	e5.8	9.1	21	11	5.6	5.4	6.8	6.2
28	e7.8	e6.2	e5.4	e4.1	e5.8	9.2	20	11	5.7	5.9	8.2	6.3
29	e7.8	e6.0	e5.0	e4.2	---	9.7	18	10	5.6	7.3	7.9	6.2
30	e7.6	e6.0	e4.8	e4.2	---	10	16	9.9	5.5	7.0	6.5	6.3
31	7.6	---	e4.8	e4.3	---	11	---	9.9	---	8.1	5.9	---
TOTAL	241.3	204.9	182.0	146.0	154.4	272.2	435.9	484.8	222.6	173.2	190.0	205.3
MEAN	7.78	6.83	5.87	4.71	5.51	8.78	14.5	15.6	7.42	5.59	6.13	6.84
AC-FT	479	406	361	290	306	540	865	962	442	344	377	407
MAX	8.4	7.7	6.8	5.4	7.0	13	22	23	9.8	8.1	8.2	11
MIN	6.9	5.6	4.8	4.0	4.4	6.0	9.9	9.9	5.5	4.1	5.0	5.9

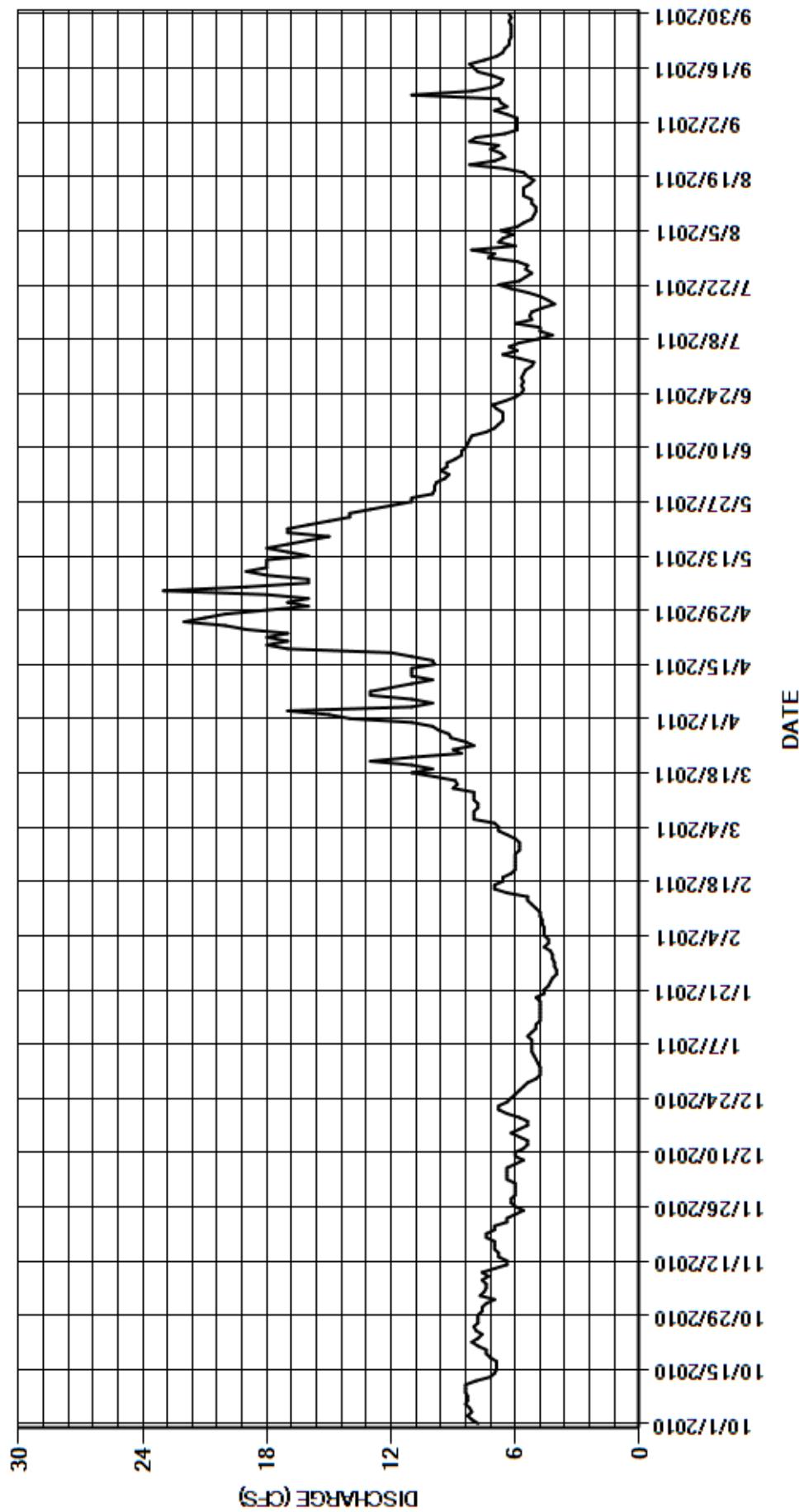
CAL YR	2010	TOTAL	7818.3	MEAN	21.4	MAX	272	MIN	4.0	AC-FT	15510
WTR YR	2011	TOTAL	2912.6	MEAN	7.98	MAX	23	MIN	4.0	AC-FT	5780

MAX DISCH: 27.3 CFS AT 05:00 ON MAY 04,2011 GH 1.43 FT SHIFT -0.04 FT

MAX GH: 1.43 FT AT 05:00 ON MAY 04,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08238000 LAJARA CREEK AT GALLEGOS RANCH NEAR CAPULIN
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
SOUTH CHANNEL NORTON DRAIN DITCH NEAR LA SAUSES
Water Year 2011

Location.--	Lat 37°17'55", long 105°51'17" referenced to North American Datum of 1983 (Pikes Stockade, CO quad, scale 1:24,000), UTM Zone 13 424251 E and 4128328 N, in SW ¼ SW ¼ sec. 2, T.35 N., R.10 E., New Mexico Principal Meridian, Conejos County, CO, Hydrologic Unit 13010002, on right bank 150 ft north of road, 13 mi south of Alamosa, CO, 7 mi northwest of LaSause, CO.
Drainage Area and Period of Record.--	Not determined. 1989 to present.
Equipment.--	Graphic water-stage recorder, data collection platform (Sutron Satlink 2), and a float-operated shaft encoder in a steel shelter on top of 2 ft diameter CMP well at a modified 3 ft Parshall Flume. The flume was modified by inserting a steel V-ramp on Aug. 16, 2010. The primary reference gage is drop tape from a RP mounted on the shelf support frame. The RP was installed on May 5, 2011 and the tape length was changed to match the outside staff reading. The secondary reference is outside staff gage in flume.
Hydrologic Conditions.--	Manmade canal to return sub-irrigation water from fields and pastures to Rio Grande River.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Nov. 18, 2010 through Mar. 16, 2011, when station was closed for the winter. The stage-discharge relation was affected by ice Oct. 26-29, Nov. 2, 5, 6, 10-17, 2010. There was one missing unit value on Sep. 16 and three missing unit values on Sep. 19, which were filled from chart with no loss in accuracy. There were three corrections made to shaft encoder ranging from -0.01 to +0.01 ft and were prorated by time from previous visit.
Datum Corrections.--	Levels were not shot this year. The Parshall flume was last inspected with levels completed three years ago on July 30, 2008. The flume is in poor condition. The levels, as well as this year's record, indicate considerable lateral slope away from well on REW and downward toward staff on LEW. A brass RP was installed on May 5, 2011 and the tape length was changed to match the outside staff reading. A -0.04 ft datum correction was made and ran back to March 16, 2011 when the gage was opened for the season.
Rating.--	Control is a 3 ft modified Parshall Flume. A steel insert was placed in the throat of the flume on August 16, 2010 to prevent the flume from isolating. Shifting is caused by the unlevel flume, and also sand and aquatic plant growth accumulating in front of and in the flume. Rating No. 1, used since Aug. 3, 1989, was used from Oct. 1, 2010 to Mar. 16, 2011. It is a standard 3 ft Parshall Flume rating. Two measurements (Nos. 337,338) were made during the period that Rating No. 1 was in use ranging in discharge from 0.57 to 0.94 cfs. Five measurements (Nos. 339-343) were made when the gage was closed for the winter ranging in discharge from 0.57 cfs to 2.78 cfs. Twelve measurements (Nos. 344-355) were made during the period from Mar. 16, 2011 to Sep. 26, 2011 when the new rating NORDSCCO02TMP was in use. These ranged in discharge from 0.54 to 7.49 cfs. They cover the discharge range experienced except for the lower daily flows on October 1-10, 19-21, 2010, and Sep. 27-30, 2011; and the higher daily flows of Nov. 9, 2010, May 29, June 7, 11-16, 22-25, 2011. The peak flow of 36.7 cfs occurred at 1145 on Nov. 9, 2010 at a gage height of 2.21 ft (datum correction -0.04 ft applied) with a shift of -0.17 ft. It exceeded high Meas. No. 348 (GH = 0.88), made May 11, 2011, by 1.29 ft in stage.
Discharge.--	Shifting control method was used during all periods of good record. The stage-discharge relation was affected by ice and discharge estimated Oct. 26-29, Nov. 2, 5, 6, 10-17, 2010. Shifts were applied as defined by measurements and distributed by time. Measurement shifts ranged from -0.17 to -0.18 ft when Standard Rating No. 1 was in use, and -0.04 to 0.00 ft when rating NORDSCCO02TMP was in use. All were given full weight and applied, except Nos. 351 and 354, which were adjusted by as much as 7.5% to smooth shift distribution. There were three flume cleaning corrections ranging from +0.01 to +0.02. All were accounted for in shift distribution and prorated from previous visit.
Special Computations.--	Discharge for periods of winter no gage-height and ice affected record was estimated using measurements, partial record days, weather records, and comparison with the station "Norton Drain near LaSause". The calculated discharge values on Oct. 6-8, 10, 14-17, 25, Nov. 8, 2010 were adjusted by +/- 0.01 cfs in order for the 2011 Water Year values to match the final 2010 Calendar Year values. The small discrepancies are due to mathematical differences between the old system using hourly average values and the new system using 15-minute unit values for the daily mean discharge calculation.
Remarks.--	Record is good, except for periods of no gage-height and ice affected record, which are estimated and poor. The peak discharge should also be considered poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SOUTH CHANNEL NORTON DRAIN DITCH NEAR LA SAUSES

RATING TABLE-- NORDSCCO01 USED FROM 01-OCT-2010 TO 16-MAR-2011
NORDSCCO02TMP USED FROM 16-MAR-2011 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

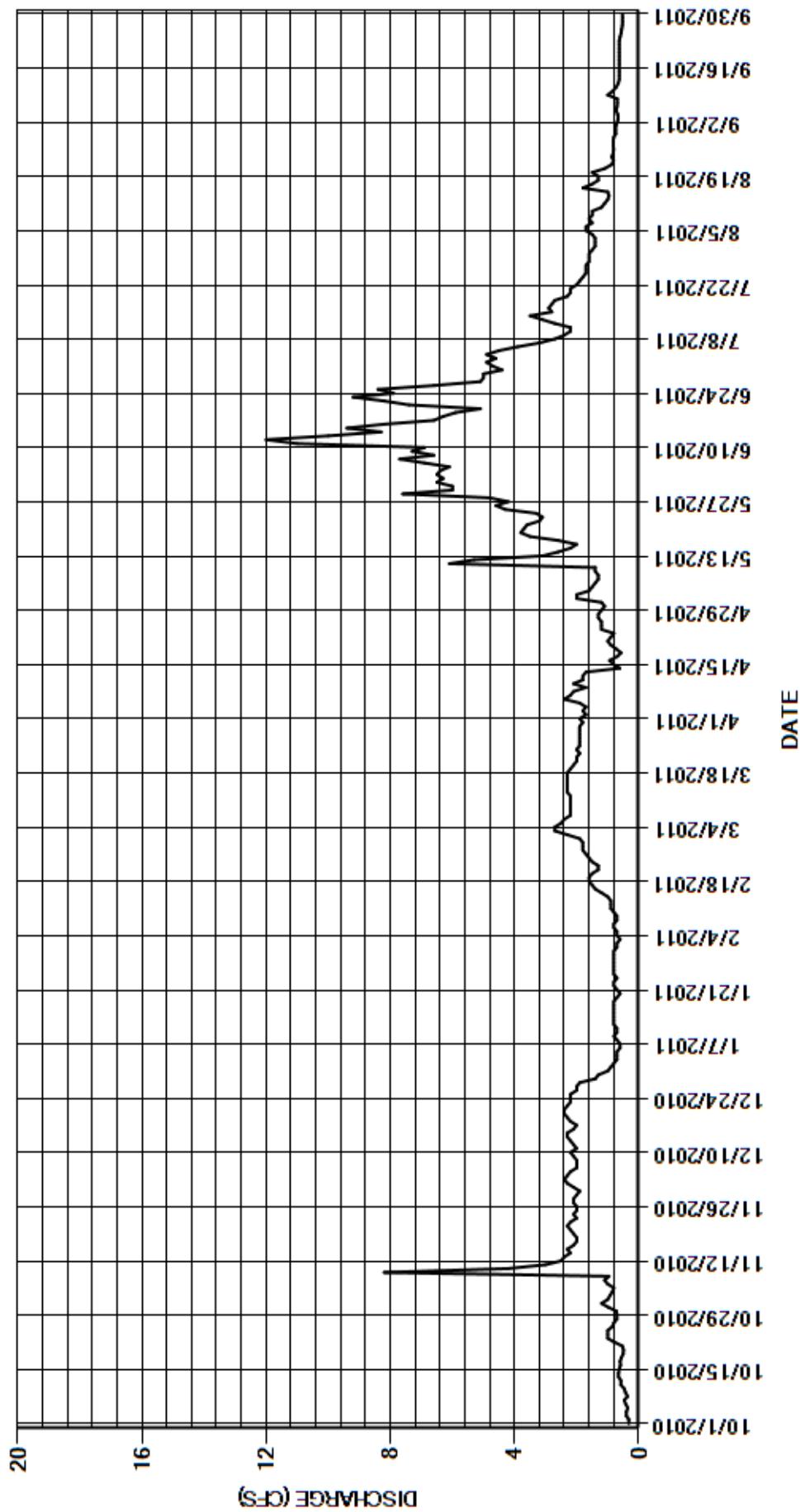
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.32	1.2	e2.1	e0.90	e0.70	e1.9	1.9	1.2	6.5	4.7	1.4	0.74
2	0.32	e1.0	e2.3	e0.80	e0.70	e2.3	1.7	2.0	6.3	4.9	1.4	0.69
3	0.40	0.93	e2.4	e0.70	e0.60	e2.7	1.8	2.0	6.5	4.6	1.4	0.66
4	0.40	0.85	e2.3	e0.70	e0.70	e2.7	1.7	1.6	6.4	4.9	1.5	0.68
5	0.35	e0.80	e2.2	e0.70	e0.70	e2.5	1.9	1.5	6.1	4.5	1.7	0.73
6	0.42	e1.0	e2.0	e0.60	e0.80	e2.4	2.4	1.4	6.9	3.9	1.7	0.70
7	0.47	1.1	e2.0	e0.60	e0.80	e2.2	2.2	1.3	7.7	3.2	1.5	0.69
8	0.36	0.96	e2.0	e0.70	e0.70	e2.2	2.1	1.3	6.6	2.7	1.6	0.69
9	0.43	8.2	e2.1	e0.80	e0.70	e2.2	1.7	1.4	7.3	2.4	1.5	1.0
10	0.47	e4.2	e2.2	e0.70	e0.80	e2.2	2.1	1.4	6.9	2.2	1.5	0.84
11	0.58	e3.0	e2.0	e0.70	e0.90	e2.2	1.8	6.1	11	2.2	1.2	0.73
12	0.57	e2.5	e2.1	e0.80	e0.90	e2.2	1.8	5.3	12	2.7	1.1	0.66
13	0.65	e2.4	e2.2	e0.80	e0.90	e2.3	1.7	3.1	10	3.1	1.0	0.63
14	0.65	e2.2	e2.3	e0.80	e1.0	e2.3	0.61	2.6	8.3	3.5	0.96	0.63
15	0.63	e2.3	e2.3	e0.80	e1.2	e2.3	0.81	2.2	9.4	2.8	1.0	0.63
16	0.59	e2.1	e2.1	e0.80	e1.4	e2.3	0.94	2.0	8.2	2.9	1.8	0.63
17	0.60	e2.0	e2.0	e0.80	e1.5	2.3	0.70	2.6	6.6	2.8	1.5	0.63
18	0.56	e2.0	e2.2	e0.80	e1.6	2.3	0.57	3.5	6.3	2.7	1.3	0.63
19	0.50	e2.1	e2.3	e0.70	e1.6	2.2	0.73	3.8	5.9	2.3	1.3	0.63
20	0.49	e2.2	e2.4	e0.60	e1.5	2.1	0.90	3.7	5.1	2.2	1.5	0.63
21	0.53	e2.3	e2.4	e0.70	e1.3	2.0	1.0	3.6	7.4	2.2	1.1	0.63
22	0.79	e2.2	e2.3	e0.80	e1.3	2.0	0.90	3.2	8.2	2.0	0.88	0.63
23	1.0	e2.0	e2.2	e0.80	e1.5	1.9	0.80	3.1	9.2	1.9	0.81	0.63
24	1.0	e2.1	e2.2	e0.70	e1.6	2.0	1.2	3.3	7.9	1.8	0.87	0.60
25	1.0	e2.0	e2.2	e0.80	e1.7	1.9	1.2	4.3	8.4	1.7	0.82	0.57
26	e0.85	e2.0	e2.0	e0.80	e1.8	1.9	1.2	4.6	6.6	1.7	0.81	0.55
27	e0.80	e2.1	e2.0	e0.80	e1.8	1.9	1.3	4.2	5.1	1.7	0.82	0.53
28	e0.70	e2.1	e1.9	e0.80	e1.8	1.9	1.3	4.8	5.0	1.6	0.82	0.52
29	e0.70	e2.0	e1.4	e0.80	---	1.9	1.2	7.6	5.0	1.6	0.81	0.52
30	0.72	e1.9	e1.3	e0.80	---	1.9	1.1	6.0	4.4	1.6	0.74	0.52
31	0.98	---	e1.0	e0.80	---	1.8	---	6.0	---	1.5	0.75	---
TOTAL	18.83	63.74	64.4	23.40	32.50	66.9	41.26	100.7	217.2	84.5	37.09	19.55
MEAN	0.61	2.12	2.08	0.75	1.16	2.16	1.38	3.25	7.24	2.73	1.20	0.65
AC-FT	37	126	128	46	64	133	82	200	431	168	74	39
MAX	1.0	8.2	2.4	0.90	1.8	2.7	2.4	7.6	12	4.9	1.8	1.0
MIN	0.32	0.80	1.0	0.60	0.60	1.8	0.57	1.2	4.4	1.5	0.74	0.52
CAL YR	2010	TOTAL	1099.23	MEAN	3.01	MAX	19	MIN	0.28	AC-FT	2180	
WTR YR	2011	TOTAL	770.07	MEAN	2.11	MAX	12	MIN	0.32	AC-FT	1530	

MAX DISCH: 36.7 CFS AT 11:45 ON NOV 09,2010 GH 2.21 FT SHIFT -0.17 FT (AT PREVIOUS DATUM)

MAX GH: 2.21 FT AT 11:45 ON NOV 09,2010 (AT PREVIOUS DATUM)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH CHANNEL NORTON DRAIN DITCH NEAR LASAUSES
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
NORTON DRAIN NEAR LA SAUSES
Water Year 2011

Location.--	Lat 37°20'5", long 105°46'17" referenced to North American Datum of 1983 (Pikes Stockade, CO quad, scale 1:24,000), UTM Zone 13 431659 E and 4132271 N, in NW ¼ SE ¼ sec. 28, T.36 N., R.11 E., New Mexico Principal Meridian, Conejos County, CO, Hydrologic Unit 13010002, on left bank 1.5 mi above confluence with Rio Grande River, 11 mi south of Alamosa, CO, 5 mi North of LaSuses, CO.
Drainage Area and Period of Record.--	Not determined. 1970 to present.
Equipment.--	Graphic water stage recorder, data collection platform (Sutron Satlink), and a float-operated shaft encoder in a 36 inch diameter CMP shelter and well at a modified six-foot Parshall Flume. The primary reference gage is drop tape from an inside reference point. The secondary reference is outside staff gage in flume. No changes.
Hydrologic Conditions.--	Manmade canal to return sub-irrigation water from fields and pastures to Rio Grande River.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Jan. 3, 4, 2011, when the well was frozen and Jan. 5, 2011 – Mar. 3, 2011 when the station was closed for the winter. Stage-discharge relation was affected by ice Oct. 26-30, Nov. 2, 25-27, 29, 30, Dec. 1-19, 25-31, 2010 and Jan. 1, 2, 2011. There were four calibration corrections made to the shaft encoder. All were prorated by time from previous visit.
Datum Corrections.--	Inspection and levels were last completed on the flume July 30, 2008. The flume is in good condition. Since this Parshall Flume has been modified with ramp inserts at the throat, it is not expected to perform as a Parshall flume.
Rating.--	The control is a modified six-foot Parshall Flume. Rating NORDLSCO05a was used all year. Rating 05a is intended to better define the very low end of the curve. Shifting is caused by sand and moss accumulating in front of and in the flume. Seventeen measurements (Nos. 753-769) were made this year ranging in discharge from 0.18 to 10.7 cfs. The measurements cover the flow range experienced except for higher daily flows on June 11-16, 22, 23, 2011 and the lower daily flows on Oct. 1 - 7, 10, 2010, Sep. 4, 5, 2011. The peak flow of 24.9 cfs occurred at 1715 on Nov. 9, 2010 at a gage height of 1.06 feet with a shift of 0.01 feet. It exceeded high measurement No. 763 (GH = 0.70), made June 9, 2011 by 0.36 feet in stage.
Discharge.--	Shifting control method was used for all periods of good record. Stage-discharge relation was affected by ice and discharge estimated Oct. 26-30, Nov. 2, 25-27, 29, 30, Dec. 1-19, 25-31, 2010 and Jan. 1, 2, 2011. During open water periods, shifts were applied as defined by discharge measurements and distributed by time. There were six cleaning corrections ranging from -0.01 to -0.03 ft. All were accounted for in the shift and prorated from previous visit. Measurements show shifts ranged from -0.03 to +0.02 feet. All measurements were given full weight and applied except No. 756 which was adjusted 5% to smooth shift distribution.
Special Computations.--	Discharge for periods of no gage-height and ice affected record was estimated using measurements, partial record days, weather records, and comparison with the station "South Channel Norton Drain near LaSuses". The calculated discharge values on Oct. 2, 14, 16, 17, 20, 22, 24, 25, were adjusted by +/- 0.01 cfs and Nov. 9-11, 13, 14, 21, 23, Dec. 20, 24, 2010 were adjusted by +/- 0.1 cfs in order for the 2011 Water Year values to match the final 2010 Calendar Year values. The small discrepancies are due to mathematical differences between the old system using hourly average values and the new system using 15-minute unit values for the daily mean discharge calculation.
Remarks.--	Record is good, except for periods of no gage-height and ice affected record, which are estimated and poor, and days that average flow is less than 1 cfs which are fair. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

NORTON DRAIN NEAR LA SAUSES

RATING TABLE-- NORDLSCO05a USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.15	0.85	e5.2	e0.90	e4.0	e6.0	2.5	1.3	9.3	7.3	1.2	0.20
2	0.13	e0.95	e5.4	e0.90	e4.0	e7.0	2.4	1.9	8.6	7.7	1.2	0.22
3	0.12	2.7	e5.6	e0.80	e4.0	e6.0	2.0	2.4	8.8	8.2	1.1	0.19
4	0.13	1.4	e6.0	e0.80	e4.0	6.4	2.2	1.8	9.5	8.8	1.1	0.15
5	0.16	1.3	e6.4	e0.70	e4.0	6.4	1.9	1.6	10	6.7	1.2	0.15
6	0.17	1.8	e6.2	e0.70	e4.0	6.7	3.0	1.6	10	5.3	1.3	0.19
7	0.17	1.5	e6.0	e0.80	e4.0	7.0	2.5	1.4	11	4.5	1.2	0.26
8	0.22	1.7	e6.0	e0.80	e4.0	6.9	2.5	1.3	10	3.9	1.2	0.28
9	0.19	8.9	e6.0	e0.90	e4.0	7.3	2.3	1.3	11	3.3	1.2	0.43
10	0.17	9.2	e6.4	e1.0	e4.0	7.5	2.5	1.4	11	2.9	1.2	0.56
11	0.21	8.0	e6.4	e2.0	e5.0	7.4	2.4	4.3	14	2.7	1.1	0.42
12	0.19	7.4	e6.2	e2.0	e6.0	7.4	2.4	7.0	17	2.7	0.86	0.36
13	0.21	7.2	e6.2	e3.0	e6.0	7.4	2.2	5.4	16	2.9	0.81	0.29
14	0.28	7.1	e6.0	e3.0	e7.0	7.3	2.0	5.3	12	3.2	0.73	0.35
15	0.27	7.0	e6.5	e3.0	e7.0	7.3	1.1	3.0	14	2.8	0.60	0.36
16	0.23	6.8	e6.2	e3.0	e6.0	7.5	1.4	3.3	13	2.4	0.68	0.37
17	0.24	6.8	e6.0	e3.0	e6.0	7.4	1.3	5.2	9.9	2.5	1.1	0.44
18	0.25	6.6	e6.0	e3.0	e6.0	6.6	0.99	6.4	8.4	2.4	0.91	0.40
19	0.24	4.9	e6.0	e3.0	e7.0	4.1	0.95	7.0	11	2.2	0.74	0.37
20	0.23	2.4	6.7	e3.0	e6.0	3.4	1.1	8.1	10	2.0	0.81	0.33
21	0.22	3.8	4.3	e4.0	e5.0	3.5	1.2	7.1	11	1.9	0.70	0.29
22	0.25	6.2	2.4	e4.0	e5.0	3.0	1.2	6.4	12	1.8	0.57	0.29
23	0.33	6.0	2.3	e4.0	e5.0	2.5	1.1	5.4	12	1.7	0.41	0.30
24	0.49	5.8	2.4	e3.0	e5.0	2.9	1.3	4.4	10	1.5	0.40	0.30
25	0.96	e5.6	e2.4	e4.0	e5.0	2.6	1.6	4.9	10	1.5	0.42	0.28
26	e0.60	e5.5	e2.3	e4.0	e5.0	2.7	1.5	6.4	9.4	1.4	0.30	0.38
27	e0.50	e5.7	e2.3	e5.0	e5.0	2.7	1.5	6.8	8.2	1.4	0.28	1.0
28	e0.50	5.9	e2.0	e6.0	e5.0	2.6	1.5	7.2	8.0	1.3	0.26	1.0
29	e0.60	e5.6	e1.5	e6.0	---	2.7	1.5	9.3	8.7	1.3	0.27	1.1
30	e0.60	e5.4	e1.3	e6.0	---	2.7	1.2	8.8	7.8	1.2	0.23	1.1
31	0.52	---	e1.0	e5.0	---	2.9	---	8.1	---	1.2	0.20	---
TOTAL	9.53	150.00	145.6	87.30	142.0	163.8	53.24	145.8	321.6	100.6	24.28	12.36
MEAN	0.31	5.00	4.70	2.82	5.07	5.28	1.77	4.70	10.7	3.25	0.78	0.41
AC-FT	19	298	289	173	282	325	106	289	638	200	48	25
MAX	0.96	9.2	6.7	6.0	7.0	7.5	3.0	9.3	17	8.8	1.3	1.1
MIN	0.12	0.85	1.0	0.70	4.0	2.5	0.95	1.3	7.8	1.2	0.20	0.15

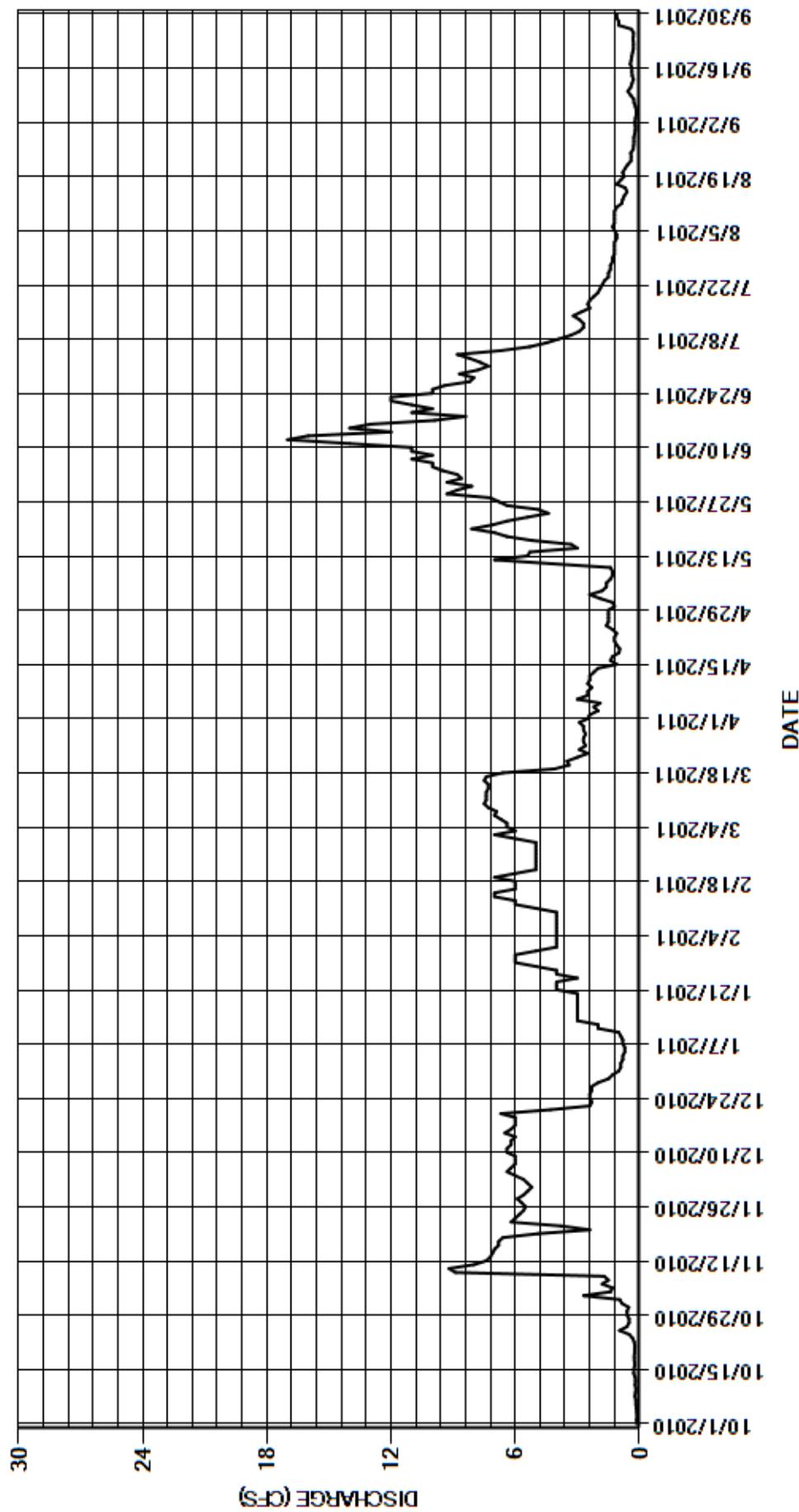
CAL YR	2010	TOTAL	1531.24	MEAN	4.20	MAX	23	MIN	0.12	AC-FT	3040
WTR YR	2011	TOTAL	1356.11	MEAN	3.72	MAX	17	MIN	0.12	AC-FT	2690

MAX DISCH: 24.9 CFS AT 17:15 ON NOV 09,2010 GH 1.06 FT SHIFT 0.01 FT

MAX GH: 1.06 FT AT 17:15 ON NOV 09,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

NORTON DRAIN NEAR LA SAUSES
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08240000 RIO GRANDE RIVER ABOVE TRINCHERA CREEK NEAR LA SAUSES
Water Year 2011

Location.--	Lat 37°18'59", long 105°44'34" referenced to North American Datum of 1983 (La Sauses, CO quad, scale 1:24,000), UTM Zone 13 434180 E and 4130242 N, in NE ¼ SE ¼ sec. 35, T.36 N., R.11 E., New Mexico Principal Meridian, Conejos County, CO, Hydrologic Unit 13010002, on right bank 0.2 mi upstream from the historical channel of Trinchera Creek, 3.2 mi north of La Sauses, CO, and 13 mi southeast of Alamosa, CO.
Drainage Area and Period of Record.--	Approximately 5,740 mi ² , includes 2,940 mi ² . in closed basin in northern part of San Luis Valley, Co. May 1936 to current year. Water quality data from 1993 to 1996.
Equipment.--	Graphic water stage recorder, data collection platform (Sutron Satlink2), and a float-operated SDR in a 7 ft. by 7 ft. exposed aggregate building with 4 ft. diameter concrete well. Primary reference gage is a drop tape from reference point on shelf. No outside gage. The graphic water-stage recorder was removed on Oct. 20, 2010.
Hydrologic Conditions.--	Watershed is comprised of valley floor and steep mountain headwaters. Headwaters areas are generally undeveloped with only sparse minimally populated areas. Valley floor is highly agriculturally based and flows from watershed are diverted for irrigation, livestock watering, domestic, commercial, recharge, and groundwater withdrawals. Flow at gage also includes return flows from all uses.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP and SDR log as backup. Record is complete and reliable except for Jan. 10 - Feb. 25, 2011 when floats were affected by ice in well, and Aug. 13-22, 26, 2011 when inlets were temporarily plugging and naturally flushing. The stage-discharge relation was affected by ice Nov. 22, 2010 through Jan. 9, 2011, Feb. 26, 27, 2011. There were two shaft encoder corrections, +0.02 ft on Mar. 1, and -0.01 ft on Mar. 11, 2011. Both were prorated by time from previous visit.
Datum Corrections.--	Levels were not shot this year. Levels were last shot to the Reference Point (RP) inside the gage on Jul. 28, 2009 using B.M. No. 2 as base. The RP elevation was within allowable limits, so a correction was not made.
Rating.--	The control is a sand streambed and channel. The sand movement causes numerous shift changes. Rating No. 12 was used again this year. Fifteen measurements (Nos. 228-242) were made this year ranging in discharge from 45.8 to 491 cfs. They cover the discharge range experienced except for the lower daily flows of Oct. 1-10, 13-18, 2010, Apr. 8-19, Sep. 29, 2011; and the higher daily flow of Jun. 8, 2011. The peak flow of 539 cfs occurred at 2200 on Jun. 8, 2011 at a gage height of 3.66 ft with a shift of -0.02 ft. It exceeded high measurement No. 237 (GH = 3.51 ft.) by 0.15 ft in stage.
Discharge.--	Shifting control method was used for all open-water periods. The stage-discharge relation was affected by ice and discharge estimated Nov. 22, 2010 through Jan. 9, 2011, Feb. 26, 27, 2011. Shifts were applied as defined by measurements and distributed by time and events Oct. 1-20, 2010. Three variable shift curves were used to redefine the rating during the remainder of the year. Measurement shifts ranged from -0.12 to +0.06 ft. All shifts were given full weight except for Nos. 228, 231, 234, 236, and 238, which were adjusted as much as 4% to smooth shift distribution.
Special Computations.--	Discharge for periods of winter no gage-height and ice affected record was estimated using comparison with nearby stations with a river accounting sheet. Discharge for periods of no gage height due to inlets temporarily plugging and flushing was estimated using gage-height trend associated with gage-height at natural flushes.
Remarks.--	Record is good, except for periods of no gage-height and ice affected record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff .
Recommendations.--	Install outside staff gage.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08240000 RIO GRANDE RIVER ABOVE TRINCHERA CREEK NEAR LA SAUSES

RATING TABLE-- RIOTRICO12 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

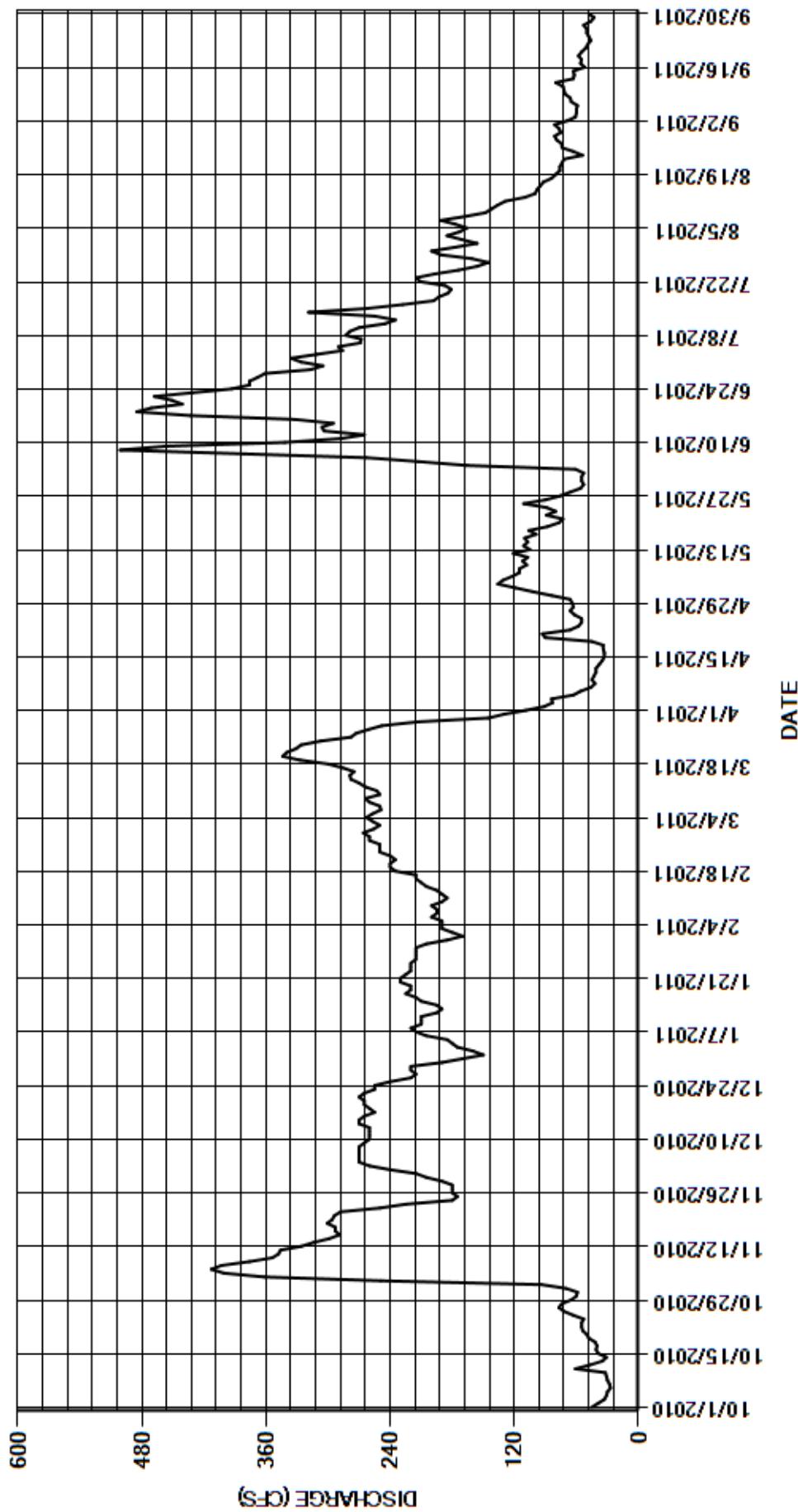
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	45	70	e215	e150	e170	256	109	84	55	326	156	81
2	39	94	e240	e160	e180	250	91	102	53	336	171	69
3	33	249	e260	e175	e190	257	83	119	61	311	185	61
4	31	362	e270	e180	e190	263	84	136	166	286	173	60
5	30	401	e270	e185	e190	257	63	131	213	290	166	60
6	27	413	e270	e205	e200	249	56	122	263	269	177	59
7	28	403	e270	e215	e195	250	46	115	381	268	191	65
8	30	376	e270	e220	e195	260	42	115	501	283	168	66
9	31	354	e265	e210	e200	264	45	108	457	279	148	71
10	32	348	e260	e210	e190	250	43	112	342	270	142	72
11	61	346	e260	e210	e185	253	41	107	288	245	136	73
12	47	326	e260	e195	e190	264	41	121	265	235	129	80
13	35	314	e260	e190	e195	270	38	105	304	255	e110	63
14	31	299	e270	e195	e205	278	35	111	306	319	e100	62
15	39	289	e270	e210	e210	279	33	107	295	262	e98	63
16	41	293	e265	e215	e215	275	33	110	332	228	e95	52
17	40	293	e255	e225	e215	286	34	99	433	198	e92	56
18	42	301	e260	e220	e235	300	34	106	485	193	e84	55
19	48	296	e265	e220	e240	327	45	88	471	184	e80	58
20	50	294	e265	e230	e240	344	90	77	441	181	e76	55
21	54	288	e270	e230	e235	340	93	73	451	187	e76	51
22	55	e250	e265	e225	e240	331	66	89	468	211	e74	49
23	55	e225	e255	e220	e250	326	58	80	431	215	72	46
24	53	e180	e255	e220	e250	307	55	89	393	197	54	48
25	63	e175	e240	e220	e250	278	55	111	376	174	63	50
26	72	e180	e220	e215	e260	273	62	90	376	156	e74	50
27	77	e180	e215	e215	e260	261	66	76	368	145	74	53
28	74	e180	e220	e215	266	248	63	66	361	161	79	46
29	65	e190	e220	e215	---	213	64	56	317	191	81	43
30	60	e205	e190	e205	---	145	66	53	305	200	75	48
31	59	---	e170	e185	---	130	---	55	---	177	77	---
TOTAL	1447	8174	7740	6385	6041	8284	1734	3013	9958	7232	3476	1765
MEAN	46.7	272	250	206	216	267	57.8	97.2	332	233	112	58.8
AC-FT	2870	16210	15350	12660	11980	16430	3440	5980	19750	14340	6890	3500
MAX	77	413	270	230	266	344	109	136	501	336	191	81
MIN	27	70	170	150	170	130	33	53	53	145	54	43
CAL YR	2010	TOTAL	70726	MEAN	194	MAX	717	MIN	25	AC-FT	140300	
WTR YR	2011	TOTAL	65249	MEAN	179	MAX	501	MIN	27	AC-FT	129400	

MAX DISCH: 539 CFS AT 22:00 ON JUN 08,2011 GH 3.66 FT SHIFT -0.02 FT

MAX GH: 4.78 FT AT 16:00 ON DEC 04,2010 (Backwater from ice)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08240000 RIO GRANDE RIVER ABOVE TRINCHERA CREEK NEAR LASAUSES
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08240500 TRINCHERA CREEK ABOVE TURNER'S RANCH
Water Year 2011

Location.--	Lat 37°22'29", long 105°17'42" referenced to North American Datum of 1983 (Ojito Peak, CO quad, scale 1:24,000), UTM Zone 13 473885 E and 4136482 N, in SW ¼ SE ¼ sec. 2, T.31 S., R.71 W., 6th Principal Meridian, Costilla County, CO, Hydrologic Unit 13010002, on right bank 0.9 mi downstream from North Fork Trinchera Creek, 1.0 mi upstream from Turners Ranch, and 8.3 mi southeast of Fort Garland, CO.
Drainage Area and Period of Record.--	45 mi ² . April 1923 to current year. Monthly records only for some periods. 1923 to 1948 seasonal records only, some missing records estimated.
Equipment.--	Graphic water-stage recorder, data collection platform (Sutron Satlink2), and a float-operated shaft encoder in a 6 ft. by 6 ft. exposed aggregate shelter and 3 ft. concrete well. The primary reference gage is a drop tape from reference point on shelf. A tipping bucket rain gage and air temperature sensor are also monitored by the DCP. Outside cantilever gage established August 3, 2011.
Hydrologic Conditions.--	Undeveloped steep alpine and subalpine terrain.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable. Stage-discharge relation was affected by ice and estimated Oct. 25-29, Nov. 10-19, 22-30, Dec. 1-19, 23-31, 2010, Jan 1-31, Feb 1-3, 18, 20-23, 25-28, Mar. 1, 2, 5, 6, 8-12, 14, 23-26, 2011. There was one instrument correction of -0.01 ft made to the shaft encoder which was prorated from previous visit.
Datum Corrections.--	Levels were run to the Reference Point (RP) inside the gage on August 3, 2011 using B.M. No. 4 as base. The RP elevation was found to be within allowable limits and no adjustments were made. Two-peg tests were performed on the Lietz level (SN 130869) on May 27, 2011, Jul. 28, 2011, and Sept. 26, 2011. The first two tests showed instrument was within tolerance, but on Sep. 26 an adjustment was made.
Rating.--	The control is a small rock weir approximately 10 feet below the gage. Minor shifting occurs mainly due to the movement of streambed materials in and above gage-pool. Rating No. 14, in use since Oct. 1, 2006, was used again this year. Measured shifts are trending more positive over time due to deposition above gage-pool increasing slope and velocity. Sixteen measurements (Nos. 190-205) were made this year ranging in discharge from 5.69 to 22.2 cfs. They cover the discharge range experienced except for lower daily flows on Jan. 10-14, 2011. The peak flow of 23.8 cfs occurred at 0215 on May 29, 2011 at a gage height of 3.61 ft with a shift of +0.03 ft. It exceeded high measurement No. 199 (GH=3.58 ft) by 0.03 ft in stage.
Discharge.--	Shifting control method was used for all periods of good record. Stage-discharge relation was affected by ice and discharge estimated Oct. 25-29, Nov. 10-19, 22-30, Dec. 1-19, 23-31, 2010, Jan 1-31, Feb 1-3, 18, 20-23, 25-28, Mar. 1, 2, 5, 6, 8-12, 14, 23-26, 2011. Shifts were applied as defined by measurements and were distributed by time. Measurement shifts ranged from +0.01 to +0.07 ft. All measurements were given full weight except Nos. 193, 194, 196, and 198 which were adjusted by as much as 6.5% to smooth shift distribution.
Special Computations.--	Discharge for periods of ice affected record were estimated using measurements, comparison with nearby station (TRIMTNCO), and weather records.
Remarks.--	Record is good, except for periods of ice affected record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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08240500 TRINCHERA CREEK ABOVE TURNER'S RANCH

RATING TABLE-- TRITURCO14 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

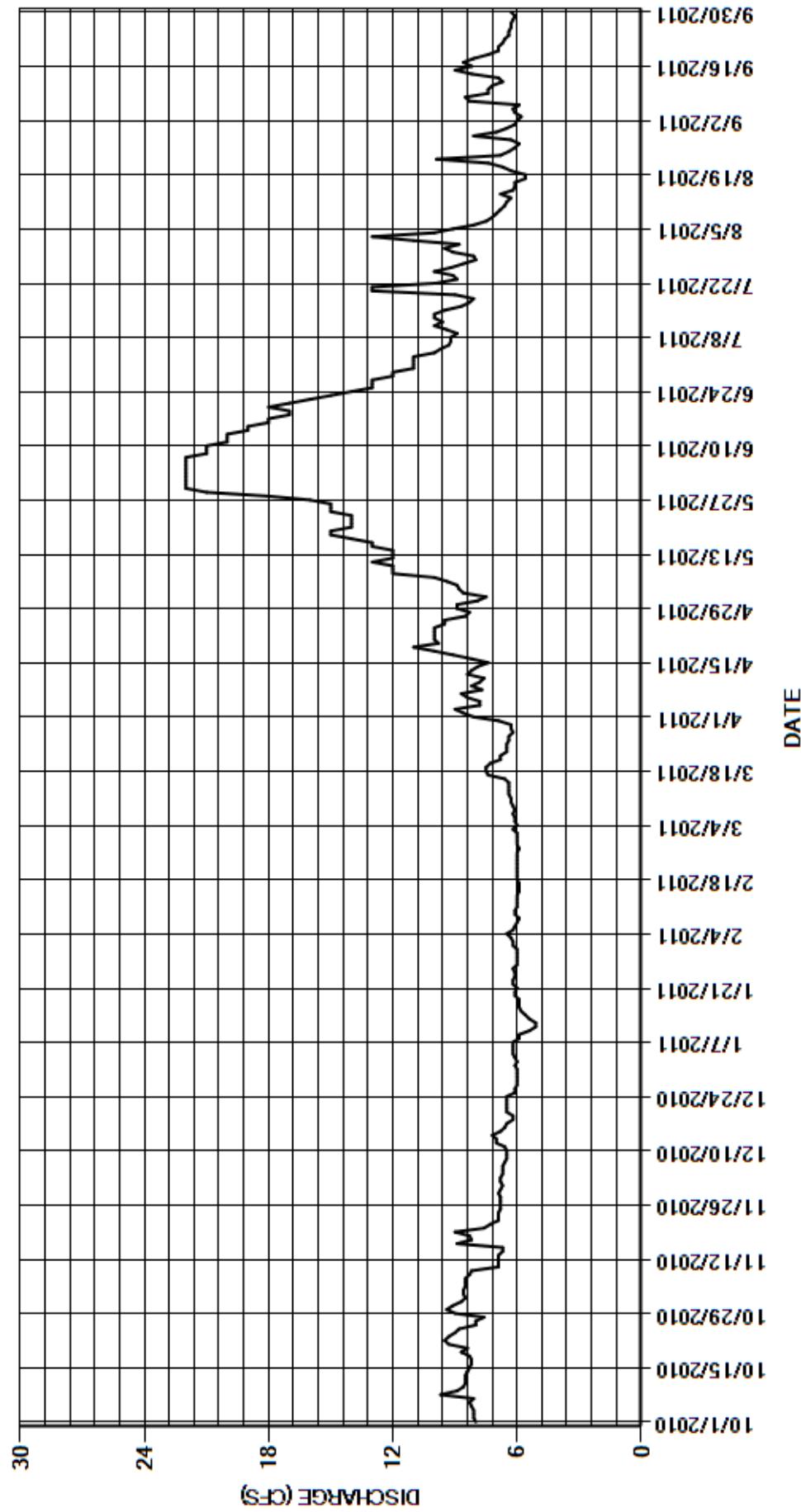
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.0	8.7	e6.7	e6.1	e6.2	e6.0	8.1	7.9	22	11	8.8	6.1
2	8.1	8.5	e6.8	e6.0	e6.2	e6.0	8.6	7.5	22	11	11	6.0
3	8.1	8.6	e6.8	e6.1	e6.3	6.2	9.0	8.6	22	11	13	5.8
4	8.1	8.6	e6.7	e6.2	6.5	6.0	7.8	8.8	22	10	10	6.1
5	8.2	8.5	e6.7	e6.2	6.2	e6.1	7.8	8.9	22	9.7	9.1	6.2
6	8.3	8.5	e6.7	e6.2	6.1	e6.1	8.4	9.4	22	9.3	8.1	5.9
7	8.1	8.5	e6.6	e6.2	6.0	6.2	8.7	10	22	9.2	7.5	8.3
8	9.7	8.3	e6.5	e5.9	5.9	e6.1	7.7	12	21	9.2	7.2	8.5
9	8.9	8.2	e6.5	e5.9	6.1	e6.2	8.2	12	21	8.9	7.0	7.4
10	8.6	e6.9	e6.5	e5.4	6.1	e6.3	7.8	12	21	9.4	6.8	7.4
11	8.5	e6.9	e6.6	e5.1	6.0	e6.3	7.6	13	20	10	6.6	7.2
12	8.5	e6.9	e7.0	e5.1	6.0	e6.4	8.4	12	20	9.6	6.5	6.7
13	8.5	e6.9	e7.0	e5.4	6.0	6.4	8.2	12	20	10	6.3	6.9
14	8.4	e6.7	e7.2	e5.6	6.0	e6.4	7.9	12	19	10	6.8	8.2
15	8.3	e6.7	e6.8	e5.8	5.9	6.4	7.4	13	19	9.5	6.2	9.0
16	8.2	e8.9	e6.6	e5.9	5.9	6.6	8.2	13	18	8.7	6.1	8.2
17	8.2	e8.2	e6.5	e5.9	5.9	7.4	9.1	14	18	8.3	6.1	8.6
18	8.3	e8.3	e6.2	e5.9	e6.0	7.5	10	15	17	8.1	5.6	8.1
19	8.7	e9.0	e6.2	e6.1	6.0	7.5	11	15	17	9.0	5.6	7.4
20	8.4	7.6	6.5	e6.1	e6.0	7.3	9.8	14	18	13	6.3	6.9
21	9.3	7.3	6.5	e6.0	e6.0	6.8	10	14	17	13	6.7	6.9
22	9.5	e6.9	6.5	e6.2	e6.0	6.8	10	14	16	9.9	7.4	6.7
23	9.3	e6.9	e6.5	e6.2	e6.0	e6.5	10	14	15	8.9	9.9	6.6
24	9.0	e6.9	e6.5	e6.1	6.0	e6.5	10	15	14	9.1	6.8	6.4
25	e8.8	e6.8	e6.1	e6.1	e6.0	e6.5	9.5	15	13	10	6.4	6.4
26	e8.0	e6.8	e6.1	e6.2	e5.9	e6.4	9.5	15	13	9.2	6.1	6.3
27	e8.0	e6.8	e6.0	e6.0	e6.0	6.4	8.5	16	13	8.6	5.9	6.3
28	e7.6	e6.8	e6.0	e6.0	e6.0	6.2	8.3	18	12	8.0	6.3	6.2
29	e9.0	e6.9	e6.0	e6.0	---	6.3	8.9	21	12	8.1	8.1	6.1
30	9.4	e6.8	e6.0	e6.0	---	6.3	8.9	22	11	9.1	7.0	6.3
31	9.1	---	e6.0	e6.0	---	6.9	---	22	---	9.5	6.5	---
TOTAL	265.1	228.3	201.3	183.9	169.2	201.0	263.3	416.1	539	298.3	227.7	209.1
MEAN	8.55	7.61	6.49	5.93	6.04	6.48	8.78	13.4	18.0	9.62	7.35	6.97
AC-FT	526	453	399	365	336	399	522	825	1070	592	452	415
MAX	9.7	9.0	7.2	6.2	6.5	7.5	11	22	22	13	13	9.0
MIN	7.6	6.7	6.0	5.1	5.9	6.0	7.4	7.5	11	8.0	5.6	5.8
CAL YR	2010	TOTAL	6540.3	MEAN	17.9	MAX	105	MIN	6.0	AC-FT	12970	
WTR YR	2011	TOTAL	3202.3	MEAN	8.77	MAX	22	MIN	5.1	AC-FT	6350	

MAX DISCH: 23.8 CFS AT 02:15 ON MAY 29,2011 GH 3.61 FT SHIFT 0.03 FT

MAX GH: 3.91 FT AT 01:45 ON FEB 02,2011 (BACKWATER FROM ICE)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08240500 TRINCHERA CREEK ABOVE TURNER'S RANCH
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08241000 TRINCHERA CREEK ABOVE MOUNTAIN HOME RESERVOIR
Water Year 2011

Location.--	Lat 37°23'41", long 105°22'9" referenced to North American Datum of 1983 (Trinchera Ranch, CO quad, scale 1:24,000), UTM Zone 13 467324 E and 4138724 N, in NE ¼ SW ¼ sec. 31, T.30 S., R.71 W., 6th Principal Meridian, Costilla County, CO, Hydrologic Unit 13010002, on right bank 200 ft west of road, 1 1/2 miles above Mountain Home Reservoir dam, 4 miles southeast of Fort Garland, CO.
Drainage Area and Period of Record.--	Approximately 61 mi ² , (from State Engineers Office). May 1, 1923 to Mar. 31, 1935 - missing some winter months; Apr. 1, 1935 to present - missing water years 1957 and 1958.
Equipment.--	Graphic water-stage recorder, data collection platform (Sutron Satlink2) and a float-operated shaft encoder in a 4-ft diameter corrugated metal shelter and well at a concrete weir. The primary reference gage is a drop tape from reference point on shelf. No change.
Hydrologic Conditions.--	Drainage area is largely undeveloped, flows may be affected by a few minor developments and irrigation on the Trinchera Ranch.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable. Stage-discharge relation was affected by ice Nov. 25-30, Dec. 24-31, 2010 and Jan. 1-9, 20-31, Feb. 1-17, 2011. There were two instrument corrections, -0.01 ft and +0.01 ft, made to the shaft encoder, which were prorated from the previous visit.
Datum Corrections.--	Levels were not run at the gage this year. Levels were last run to the Reference Point (RP) inside the gage on Aug. 26, 2010 using B.M. No. 1 as base. The RP elevation was within allowable limits; therefore, a correction was not required or made.
Rating.--	The control is a concrete weir approximately 15 feet below the gage. Rating No. 7, in use since Oct. 1, 2001 to Mar. 25, 2010 was used for the entire water year after the gage pool was cleaned at the end of WY2010. Sixteen measurements (Nos. 884-899) were made this year ranging in discharge from 3.09 to 20.3 cfs. They cover the discharge range experienced except for the lower daily flows on Dec. 29, Jun. 27-30, Jul. 1-7, 9-10, 12-17, 24, Aug. 9-20, 27, 28, Sep. 1-6, 2011. The peak flow of 41.2 cfs occurred at 1500 on May 19, 2011 at a gage height of 0.95 ft with a shift of +0.03 ft. It exceeded high measurement No. 892 (GH = 0.69 ft.), made May 19, 2011 by 0.26 ft. in stage.
Discharge.--	Shifts were applied by stage using four variable stage-shift relationships developed during the water year. Stage-discharge relation was affected by ice and discharge estimated on Nov. 25-30, Dec. 24-31, 2010 and Jan. 1-9, 20-31, Feb. 1-17, 2011. Measurement shifts ranged from -0.01 to +0.04 ft. All measurements were given full weight except Nos. 885, 887, 894 and 898, which were adjusted as much as 7% to smooth shift distribution. One significant cleaning correction due to beaver dam on the control was noted Jun. 28 and discharge was estimated back to point where stage started to climb. There were two cleaning corrections; a -0.09 ft cleaning correction June 28, 2011, which was prorated back to when the debris started to collect on the control and a +0.02 ft cleaning correction October 20, 2011, which was prorated back to the previous visit.
Special Computations.--	Discharge for periods of ice affected record was estimated using discharge measurements and temperature records.
Remarks.--	Record is good, except during periods of ice affected record, which is estimated and poor, and June 16 - 28 when debris was on control, which is rated fair. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	Maintain clean gage pool.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08241000 TRINCHERA CREEK ABOVE MOUNTAIN HOME RESERVOIR

RATING TABLE-- TRIMTNCO07 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.9	6.5	4.5	e4.5	e5.0	5.5	6.2	4.9	10	3.0	4.5	2.2
2	5.6	6.3	5.4	e4.8	e5.0	5.7	6.3	3.4	12	2.9	4.7	2.3
3	5.4	7.0	5.5	e4.8	e4.8	5.8	6.9	4.1	12	2.9	7.2	1.9
4	5.9	6.9	5.4	e4.8	e4.8	5.6	5.9	4.4	12	2.6	4.1	2.0
5	5.8	6.6	5.3	e5.0	e5.0	4.7	5.3	4.7	12	2.5	3.7	2.4
6	5.8	7.0	5.1	e5.0	e5.0	5.3	5.4	4.9	11	2.8	3.4	2.2
7	5.6	6.6	5.1	e5.0	e4.8	5.6	5.2	4.4	11	2.8	3.3	3.9
8	6.8	6.5	4.7	e5.0	e5.0	5.3	3.9	4.6	11	3.2	3.2	4.5
9	6.8	6.2	5.4	e5.0	e5.0	4.9	3.6	5.2	10	1.9	3.0	3.6
10	6.2	5.5	5.6	5.2	e5.0	4.3	3.6	5.3	11	2.3	2.8	3.5
11	6.3	5.6	5.3	5.2	e5.2	5.4	4.3	5.3	11	3.2	2.7	3.8
12	6.2	5.7	4.9	5.5	e4.8	5.5	5.0	5.2	11	1.8	2.7	3.2
13	6.6	4.3	5.2	5.5	e4.5	5.4	4.9	4.9	10	2.4	2.5	3.7
14	6.3	4.4	5.0	5.3	e4.8	5.2	4.8	4.9	10	2.7	2.7	6.4
15	6.0	6.3	5.3	5.0	e4.5	5.3	3.8	5.4	11	2.4	2.4	7.6
16	5.4	6.2	5.2	4.7	e4.5	5.4	4.5	5.5	13	2.0	2.1	7.2
17	5.7	6.8	5.1	4.7	e4.5	5.7	4.9	6.0	12	1.7	2.4	7.3
18	6.5	5.9	5.5	4.8	5.0	6.1	5.3	6.1	9.9	3.3	2.2	7.5
19	6.4	6.0	6.0	4.8	5.7	5.9	5.0	7.7	9.5	5.2	2.0	6.6
20	6.2	6.3	5.7	e4.7	5.4	6.0	3.9	6.9	10	6.9	2.2	6.1
21	7.3	5.8	5.5	e5.0	5.3	5.9	3.5	6.4	9.9	6.8	3.2	6.0
22	7.0	5.3	5.3	e5.0	5.6	5.9	4.1	5.8	8.5	3.3	3.7	5.8
23	6.6	3.7	5.5	e4.8	5.7	4.9	4.6	5.7	6.9	3.2	5.7	5.2
24	6.6	5.8	e5.0	e4.8	5.3	5.6	4.8	6.2	5.2	3.0	3.2	3.6
25	6.9	e6.5	e4.5	e4.5	5.1	5.5	4.8	6.2	4.6	3.8	3.9	3.4
26	6.0	e4.2	e4.2	e4.5	5.2	5.6	5.1	6.2	3.3	3.7	3.2	3.3
27	6.4	e3.6	e4.5	e4.5	5.0	5.6	5.1	6.7	3.0	4.0	2.9	3.2
28	5.4	e4.4	e4.5	e5.0	5.2	5.4	5.2	7.8	3.0	3.4	2.8	3.4
29	6.8	e5.2	e3.0	e5.0	---	6.2	5.6	10	3.0	3.5	3.7	3.2
30	6.6	e5.0	e4.6	e5.0	---	5.6	5.3	10	2.9	4.4	4.1	3.2
31	6.4	---	e4.8	e5.0	---	5.5	---	9.7	---	4.9	4.2	---
TOTAL	193.4	172.1	156.6	152.4	140.7	170.3	146.8	184.5	269.7	102.5	104.4	128.2
MEAN	6.24	5.74	5.05	4.92	5.02	5.49	4.89	5.95	8.99	3.31	3.37	4.27
AC-FT	384	341	311	302	279	338	291	366	535	203	207	254
MAX	7.3	7.0	6.0	5.5	5.7	6.2	6.9	10	13	6.9	7.2	7.6
MIN	5.4	3.6	3.0	4.5	4.5	4.3	3.5	3.4	2.9	1.7	2.0	1.9

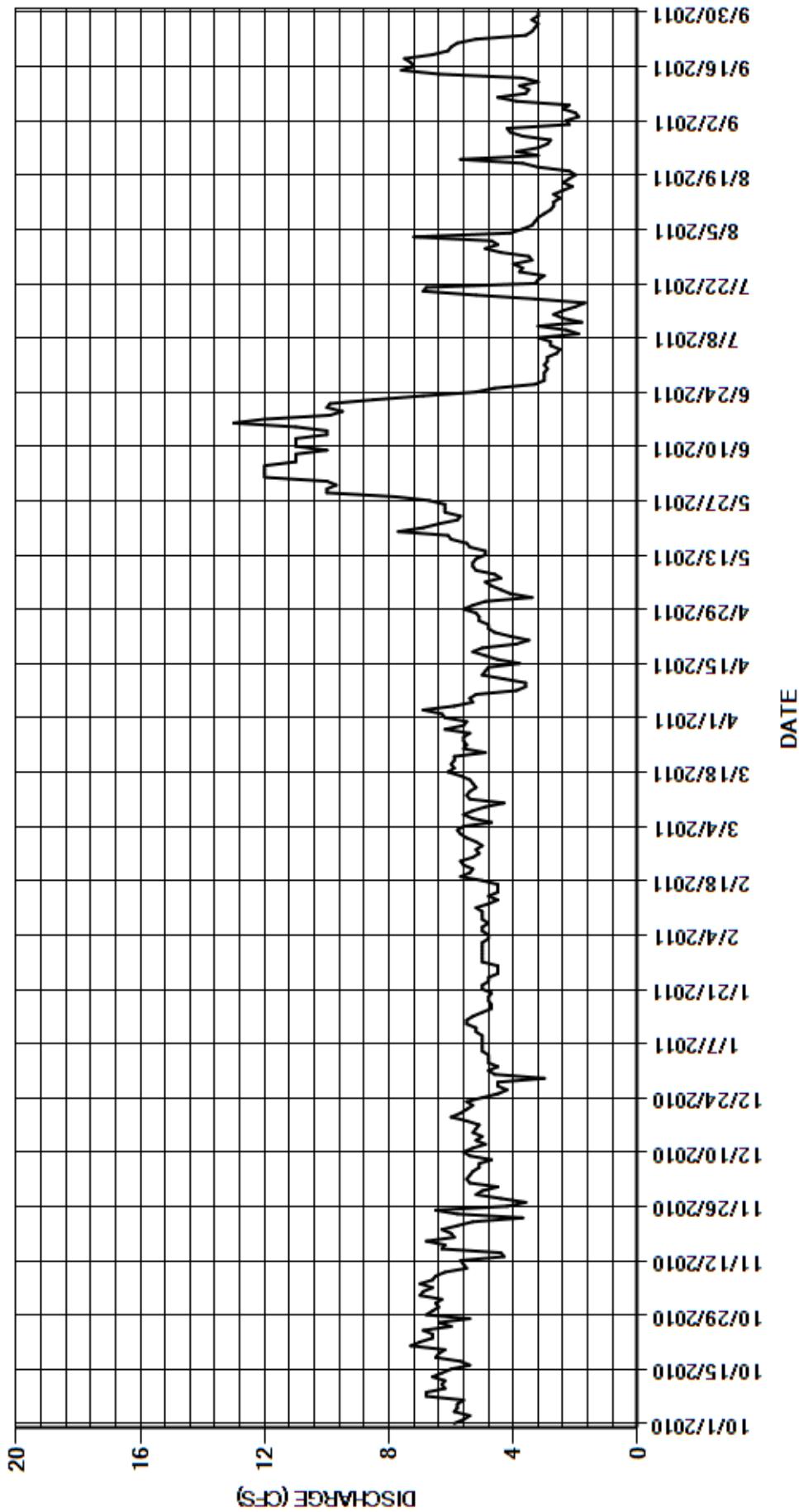
CAL YR	2010	TOTAL	4798.0	MEAN	13.1	MAX	82	MIN	3.0	AC-FT	9520
WTR YR	2011	TOTAL	1921.6	MEAN	5.26	MAX	13	MIN	1.7	AC-FT	3810

MAX DISCH: 41.2 CFS AT 15:00 ON MAY 19,2011 GH 0.95 FT SHIFT 0.03 FT (From chart, Beaver dam removed upstream)

MAX GH: 0.95 FT AT 15:00 ON MAY 19,2011 (From chart, Beaver dam removed upstream)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08241000 TRINCHERA CREEK ABOVE MOUNTAIN HOME RESERVOIR
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08241500 SANGRE DE CRISTO CREEK NEAR FORT GARLAND
Water Year 2011

Location.--	Lat 37°25'30", long 105°24'54" referenced to North American Datum of 1983 (Fort Garland, CO quad, scale 1:24,000), UTM Zone 13 463292 E and 4142091 N, in NE ¼ SE ¼ sec. 22, T.30 S., R.72 W., 6th Principal Meridian, Costilla County, CO, Hydrologic Unit 13010002, on left bank at ice house road bridge, 2,200 ft upstream from Garland Canal, 1.0 mi east of Fort Garland, CO, and 6.3 mi upstream from Ute Creek.
Drainage Area and Period of Record.--	190 mi ² . February 17, 1915 to April 17, 1915, April, 1916 to Sept. 30, 1916, 1923 to 1930, 1932 to current year (partial year record only some years).
Equipment.--	Graphic water-stage recorder, data collection platform (Sutron Satlink2) and a float-operated shaft encoder in a 48-inch diameter CMP shelter and well. The shaft encoder float is operated in an oil cylinder. The primary reference gage is a drop tape from reference point on shelf. No changes were made this year.
Hydrologic Conditions.--	Station is located in foothills of mountain canyon with moderate development of homesites in area. There are major diversions above gage for irrigation use.
Gage-Height Record.--	Primary record is fifteen minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Feb. 3-15, 2011, when the oil cylinder was frozen. One missing unit value on Jul. 1 was filled from chart. The stage-discharge relation was affected by backwater from ice Oct. 26-29 Nov. 12-18, Nov. 22-30, Dec. 1, 4, 6-9, 11-14, 16, 24-31, 2010, Jan. 1-31, Feb. 1, 2, 18, 20-22, Mar. 5, 9, 2011. The stage-discharge relation was affected by backwater from beaver dam(s) Oct. 4-7, 16-19, 2010. Three instrument corrections were made to the shaft encoder during the year ranging from -0.01 to +0.02 ft. These corrections were prorated by time from the previous good gage reference. There was one +0.01 ft flush correction, which was prorated back to previous inflection point.
Datum Corrections.--	Levels were shot to the RP inside the shelter on Jul. 18, 2011. The RP elevation was found to be within allowable limits, but since the RP was being remounted, it was corrected by -0.009 ft. A +0.01 datum correction was applied to the record and all measurement gage heights straight back to the period when oil cylinder was frozen.
Rating.--	The control is a concrete weir approximately 14 feet downstream of the gage. Shifting occurs mainly due to the movement of streambed materials in and above gage pool. At higher flows the channel becomes the control and is subject to backwater from a downstream diversion structure. Rating No. 19-2 was used again this year. Rating No. 19-2 was drawn so that the upper end is the same as Rating No. 18, in use since October 1, 1979, and represents base rating conditions with minimal backwater. Sixteen measurements (Nos. 897-912) were made this year ranging in discharge from 0.13 to 20 cfs. They cover the discharge range experienced except for lower daily flows on Aug. 21 and 27, 2011 and higher daily flows on Apr. 4, 7, 8, 2011. The peak flow of 24.3 cfs occurred at 1600 on Mar. 4, 2011 at a gage height of 1.66 ft with a shift of -0.04 ft. It exceeded high measurement No. 903 (GH = 1.59 ft), made Mar. 8, 2011, by 0.07 ft in stage.
Discharge.--	Shifting control method was used for all open water periods. Shifts were applied as defined by measurements and distributed by time and events. Measurement shifts ranged from -0.04 to +0.01 ft. All were given full weight except Nos. 897 and 904, which were adjusted as much as 6% to smooth shift distribution. Discharge was estimated when stage-discharge relation was affected by ice and backwater from beaver dams, and when gage-height was unreliable due to ice in oil cylinder: Oct. 4 – 7, Oct. 16-19, Oct. 26-29, Nov. 12-18, Nov. 22 – Dec. 1, Dec. 4, Dec. 6-9, Dec. 11-14, Dec. 16, Dec. 24 – Feb. 15, Feb. 18, Feb. 20-22, Mar. 5, and Mar. 9. There were two cleaning corrections, -0.01 ft and -0.02 ft, which were prorated by time as shifts from previous visits.
Special Computations.--	Discharge for periods of backwater caused by beaver dams were estimated by distributing shifts that were derived from gage-height change during beaver dam removal. Discharge for periods of unreliable gage-height and ice affected record was estimated using discharge measurements, comparison with the nearby stations and weather records from Trinchera Creek above Turners Ranch and Ute Creek near Fort Garland, and records from Ute and Trinchera SNOTEL observations. Estimations for this site were very difficult between Feb. 10 and Apr. 15 due to a large increase in flow that was likely due to precipitation during this period and melting of low and medium elevation snow.
Remarks.--	Record is fair, except for periods of unreliable gage height, ice affect, and backwater from beaver dams, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08241500 SANGRE DE CRISTO CREEK NEAR FORT GARLAND

RATING TABLE-- SANFTGCO19-2 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.7	8.1	e5.5	e4.5	e6.5	11	17	7.7	2.4	0.31	0.29	0.14
2	3.8	8.1	7.4	e5.0	e6.5	13	19	11	2.1	0.31	0.31	0.14
3	3.8	7.4	7.7	e6.0	e7.0	14	20	10	1.9	0.32	0.39	0.14
4	e4.2	7.9	e7.6	e7.0	e8.0	15	21	11	1.8	0.30	0.36	0.14
5	e4.4	8.1	8.3	e7.0	e7.0	e12	20	10	1.5	0.26	0.36	0.14
6	e4.6	8.2	e7.0	e7.5	e6.0	12	20	11	1.4	0.27	0.33	0.14
7	e4.9	8.3	e7.5	e8.0	e7.0	13	22	11	1.1	0.26	0.29	0.17
8	4.5	8.4	e5.8	e8.5	e6.0	12	22	11	0.89	0.27	0.28	0.22
9	4.5	8.4	e7.2	e8.0	e6.0	e10	20	11	0.78	0.24	0.25	0.20
10	4.8	8.2	9.7	e7.0	e6.5	11	20	9.3	0.73	0.26	0.23	0.20
11	5.1	7.6	e5.6	e7.0	e7.0	12	20	7.2	0.69	0.29	0.23	0.21
12	5.3	e7.0	e6.6	e7.0	e9.0	13	20	6.3	0.67	0.31	0.22	0.16
13	5.5	e6.0	e7.4	e7.5	e10	14	20	6.2	0.69	0.34	0.22	0.18
14	6.2	e6.0	e7.6	e8.0	e11	14	12	6.2	0.69	0.29	0.21	0.25
15	5.5	e6.0	7.8	e7.5	e12	14	4.0	6.2	0.65	0.27	0.16	0.29
16	e5.6	e6.5	e7.0	e7.5	11	14	3.3	6.1	0.41	0.25	0.15	0.27
17	e5.6	e6.0	4.5	e8.5	10	16	3.0	5.9	0.39	0.24	0.15	0.26
18	e5.9	e7.2	6.9	e9.0	e10	18	2.9	5.4	0.44	0.23	0.14	0.22
19	e6.5	8.1	11	e9.0	11	17	2.8	5.3	0.40	0.19	0.14	0.18
20	5.9	8.9	13	e8.0	e10	17	2.8	5.2	0.39	0.18	0.15	0.16
21	6.6	9.4	11	e8.5	e9.5	17	2.8	5.2	0.43	0.19	0.12	0.17
22	8.7	e7.4	11	e9.0	e10	17	2.7	5.0	0.43	0.18	0.13	0.16
23	6.6	e5.6	11	e8.5	11	14	2.8	4.9	0.46	0.18	0.13	0.16
24	6.9	e5.0	e9.0	e8.0	11	15	2.9	5.2	0.45	0.18	0.13	0.16
25	7.2	e5.0	e8.5	e8.0	11	13	3.2	5.5	0.42	0.40	0.17	0.16
26	e7.4	e5.0	e6.5	e8.0	10	14	3.2	5.5	0.38	0.31	0.13	0.16
27	e7.3	e5.5	e6.5	e8.5	10	15	3.2	5.3	0.37	0.25	0.12	0.16
28	e6.5	e5.0	e6.5	e9.0	10	15	3.1	4.6	0.37	0.23	0.13	0.16
29	e7.5	e5.0	e6.0	e9.0	---	15	2.8	4.6	0.34	0.24	0.13	0.16
30	8.8	e4.5	e4.5	e8.0	---	15	2.6	4.2	0.33	0.25	0.13	0.18
31	8.3	---	e4.0	e7.0	---	15	---	2.9	---	0.27	0.13	---
TOTAL	182.1	207.8	235.6	239.0	250.0	437	321.1	215.9	24.00	8.07	6.31	5.44
MEAN	5.87	6.93	7.60	7.71	8.93	14.1	10.7	6.96	0.80	0.26	0.20	0.18
AC-FT	361	412	467	474	496	867	637	428	48	16	13	11
MAX	8.8	9.4	13	9.0	12	18	22	11	2.4	0.40	0.39	0.29
MIN	3.7	4.5	4.0	4.5	6.0	10	2.6	2.9	0.33	0.18	0.12	0.14

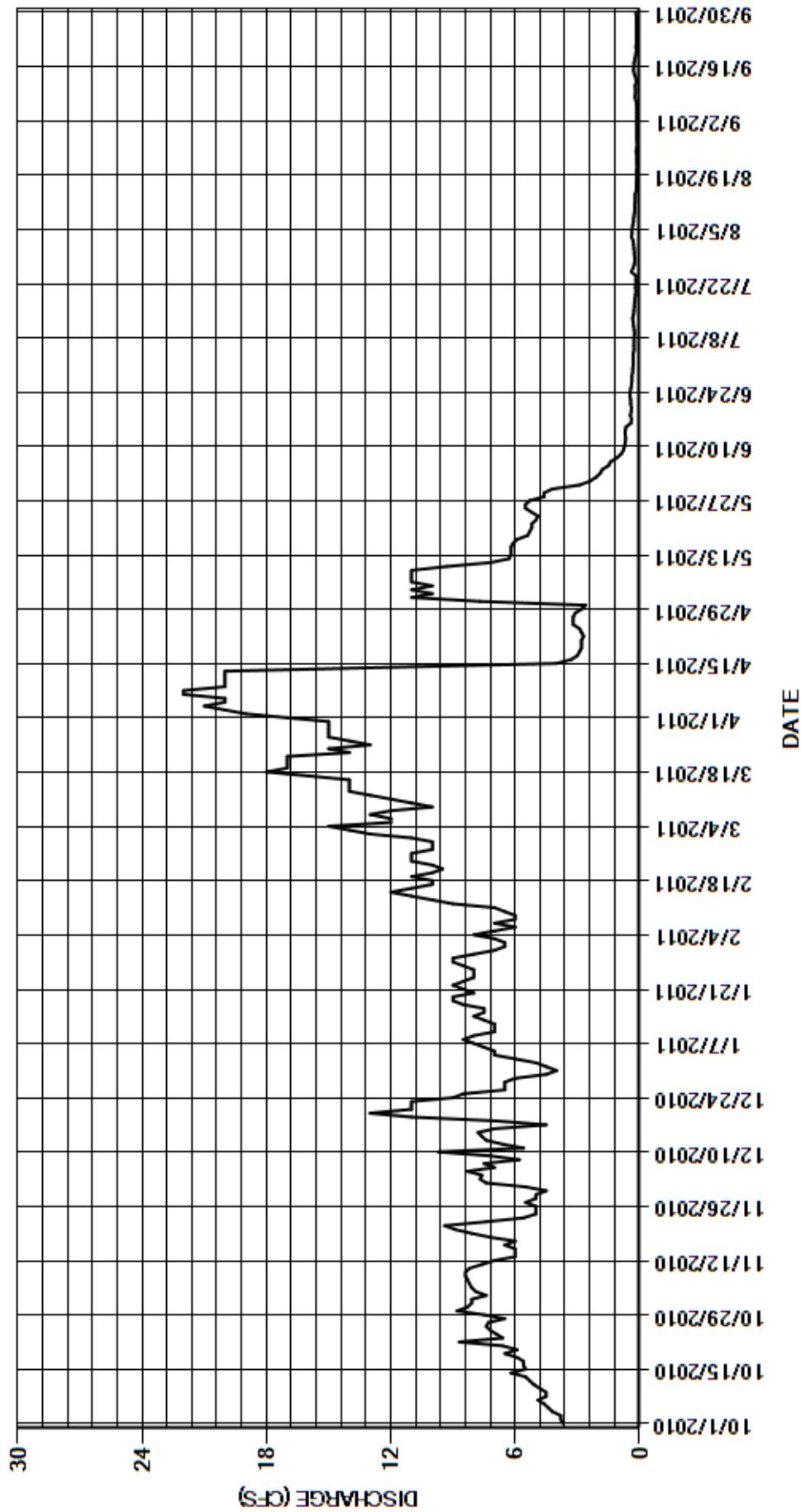
CAL YR	2010	TOTAL	7597.90	MEAN	20.8	MAX	152	MIN	1.7	AC-FT	15070
WTR YR	2011	TOTAL	2132.32	MEAN	5.84	MAX	22	MIN	0.12	AC-FT	4230

MAX DISCH: 24.3 CFS AT 16:00 ON MAR 04,2011 GH 1.66 FT SHIFT -0.04 FT

MAX GH: 2.08 FT AT 06:45 ON FEB 20,2011 (BACKWATER FROM ICE)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08241500 SANGRE DE CRISTO CREEK NEAR FORT GARLAND
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08242500 UTE CREEK NEAR FORT GARLAND
Water Year 2011

Location.--	Lat 37°26'50", long 105°25'33" referenced to North American Datum of 1983 (Fort Garland, CO quad, scale 1:24,000), UTM Zone 13 462334 E and 4144571 N, in NE ¼ NW ¼ sec. 15, T.30 S., R.72 W., 6th Principal Meridian, Costilla County, CO, Hydrologic Unit 13010002, on left bank 1.5 mi north of Fort Garland, CO, and 6 mi upstream from mouth.
Drainage Area and Period of Record.--	32 mi ² . Staff gage established on weir Mar. 1915 and operated to Oct. 1916. Continuous record from May 1923 to present.
Equipment.--	Graphic water-stage recorder, data collection platform (Sutron Satlink2), a float-operated shaft encoder, and a tipping bucket rain gage in a 4 ft CMP shelter and well. The primary reference gage is a drop tape from reference point on shelf.
Hydrologic Conditions.--	The majority of the drainage above the gage is undeveloped steep alpine and subalpine terrain. There are five active irrigation diversions above the gage.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Nov. 18, 2010 through Mar. 8, 2011 when the station was closed for the winter. The stage-discharge relation was affected by ice Oct. 26-29, Nov. 10-17, 2010 and Mar. 9-12, 23-26, Apr. 5, 10, 11, 15, 16, May 2, 3, 2011. There were three shaft encoder corrections; -0.01 feet on Mar. 21, +0.01 ft on Apr. 18, and -0.01 ft. on May 19, 2011. All were prorated by time from previous visit.
Datum Corrections.--	Levels were not shot this year. Levels were last shot to reference point inside the gage on Oct. 26, 2009 using BM 1 as base. The reference point elevation was corrected -0.026 feet on that day.
Rating.--	The control is a concrete broad crested weir approximately 10 feet below the gage. Shifting occurs mainly due to the scour and fill in the gage pool. The gage pool was cleaned on Mar. 8 and Apr. 18, 2011, which changed the stage-discharge relation. Rating No. 18, created Sep. 13, 2008, was used again this water year. Sixteen measurements (Nos. 239-254) were made this year ranging in discharge from 4.77 to 43.9 cfs. They cover the flow range experienced except for lower daily flows on Nov. 26, 27, 30, Dec. 1, 8, 9, 17, 18, 31, 2010, Jan. 1-4, Feb. 9-11, Aug. 15-20, 2011; and higher daily flows on May 29, Jun. 2, 3, 6, 7, 2011. The peak flow of 59.7 cfs occurred at 2330 on May 28, 2011 at a gage height of 2.29 feet with a shift of -0.01 feet. It exceeded high measurement No. 249 (GH = 2.14), made Jun. 7, 2011 by 0.15 feet in stage.
Discharge.--	Shifting control method was used for all open water periods. The stage-discharge relation was affected by ice and discharge estimated Oct. 26-29, Nov. 10-17, 2010 and Mar. 9-12, 23-26, Apr. 5, 10, 11, 15, 16, May 2, 3, 2011. Four variable shift curves were developed and used to define the stage-shift relation during different periods. Shift curve -VS11-1, developed from measurements 232-239, was used from Oct. 1 to Nov. 18, 2010 when station was closed. Shift curve VS11-2 was used from Mar. 8, when station was opened and gage pool (GP) cleaned, to Apr. 18, 2011 when GP was cleaned again. Several shifts were manually applied on Apr. 18 to correct unit value discharge during GP cleaning. Shift curve VS11-3 was used from Apr. 18 after cleaning GP to May 27, 2011. Since high measurement No. 249 (shift = -0.01) was not adjusted to the rating and to prevent creating shift curves that cross the rating, a -0.01 shift was distributed during the high water period from May 27 to Jun. 9, 2011. Shift curve VS11-4 was used from Jun. 9 to Oct. 20, 2011. All measurements were given full weight except Nos. 247, 248, and 251, which were adjusted by as much as 6% to smooth shift distribution.
Special Computations.--	Discharge for periods of no gage-height and ice affected record was estimated using measurements and weather records.
Remarks.--	Record is good, except for periods of no gage-height and ice affected record, which are estimated and poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	The gage pool at this site requires regular cleaning to enable the concrete control to be the controlling feature at lower flows.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08242500 UTE CREEK NEAR FORT GARLAND

RATING TABLE-- UTEFTGCO18 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

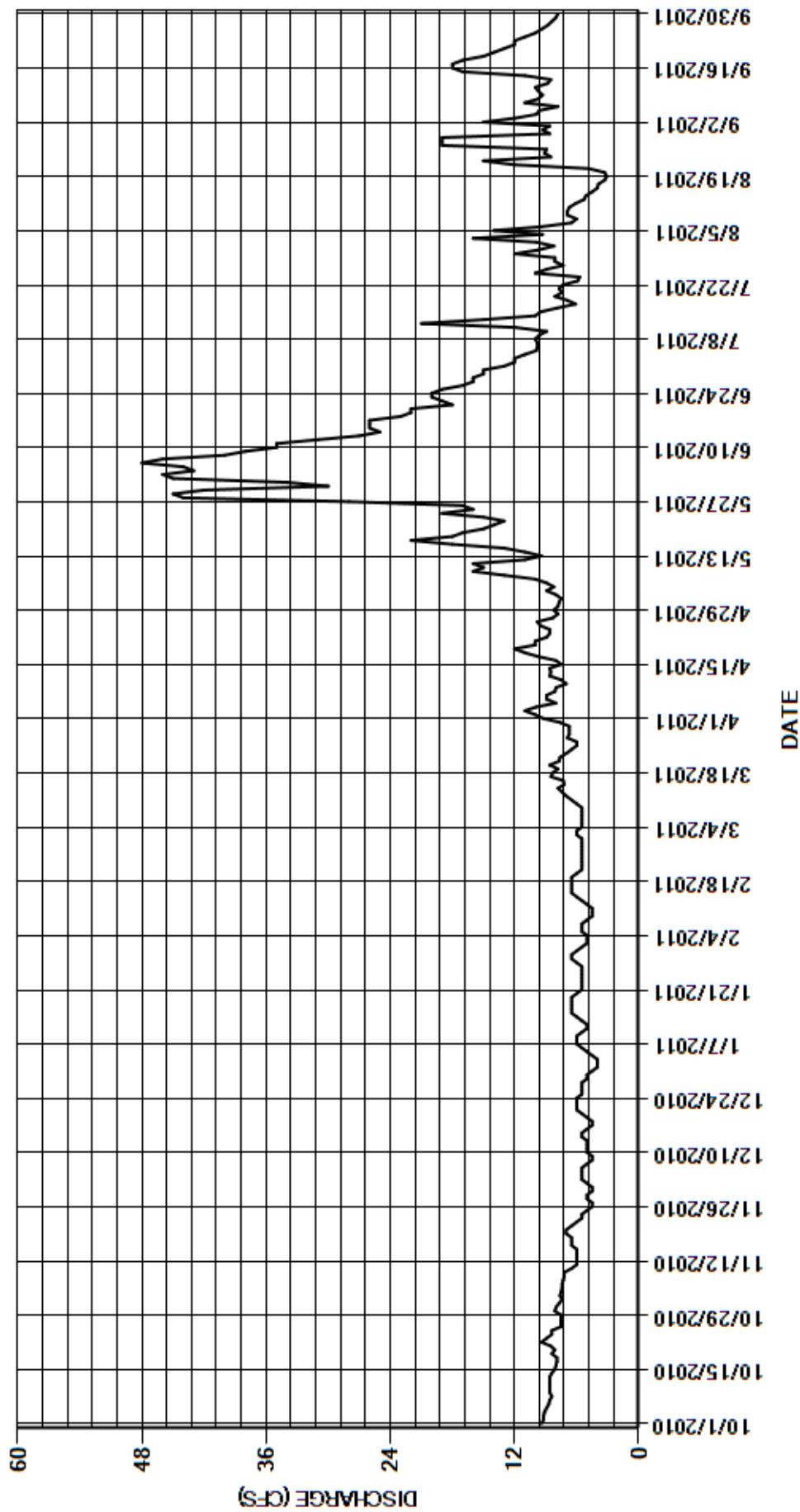
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.4	7.7	e4.5	e4.0	e5.5	e5.5	9.2	7.7	34	13	8.2	8.6
2	9.2	7.4	e5.0	e4.0	e5.0	e6.0	10	e7.5	45	12	9.9	15
3	9.2	7.6	e5.5	e4.0	e5.0	e6.0	11	e8.0	46	12	16	12
4	9.1	7.5	e5.5	e4.5	e5.0	e5.5	9.9	8.9	43	11	9.3	9.9
5	8.9	7.4	e5.5	e5.0	e5.5	e5.5	e8.0	8.2	44	9.9	14	9.6
6	8.7	7.4	e5.5	e5.5	e5.5	e5.5	8.9	8.9	48	9.8	9.4	7.8
7	8.6	7.3	e5.0	e6.0	e5.5	e5.5	8.9	10	46	9.8	6.5	11
8	8.4	7.2	e4.5	e6.0	e5.0	e5.5	8.1	13	40	10	6.0	9.7
9	8.6	7.2	e4.5	e6.0	e4.5	e5.5	8.0	16	38	9.6	6.9	9.3
10	8.6	e6.5	e5.0	e5.5	e4.5	e6.0	e7.0	15	35	8.9	6.9	9.7
11	8.6	e6.0	e5.0	e5.0	e4.5	e6.5	e7.5	16	35	12	6.7	10
12	8.6	e6.0	e5.0	e5.0	e5.0	e7.0	8.6	11	31	21	6.1	8.8
13	8.6	e6.0	e5.0	e5.5	e5.5	7.4	8.5	9.4	27	15	5.3	8.5
14	8.4	e6.0	e5.5	e6.0	e6.0	7.8	8.6	11	25	10	5.1	11
15	8.1	e6.0	e5.5	e6.5	e6.5	7.2	e7.5	13	26	9.5	4.5	17
16	8.0	e6.5	e5.0	e6.5	e6.5	7.3	e8.0	18	26	7.9	4.0	18
17	7.9	e6.5	e4.5	e6.5	e6.5	8.5	9.7	22	26	6.1	3.9	18
18	7.9	e6.5	e4.5	e6.5	e6.5	8.3	11	18	23	6.9	3.3	17
19	8.4	e7.0	e5.0	e6.5	e6.5	7.8	12	17	22	8.1	3.1	15
20	8.1	e7.0	e5.5	e6.0	e6.0	8.6	10	15	22	7.4	3.3	14
21	8.5	e6.5	e6.0	e5.5	e5.5	7.7	10	14	18	7.7	4.8	13
22	9.4	e6.0	e6.0	e5.5	e5.5	7.6	8.9	13	19	7.3	12	12
23	8.9	e5.5	e6.0	e5.5	e5.5	e7.0	8.6	15	20	5.9	15	12
24	8.4	e5.5	e6.0	e5.5	e5.5	e6.5	8.6	19	20	5.7	8.5	11
25	8.4	e5.0	e5.5	e5.5	e5.5	e6.0	9.5	16	19	10	9.1	10
26	e7.5	e4.5	e5.5	e5.5	e5.5	e6.0	9.8	17	17	8.9	8.9	9.4
27	e7.5	e4.5	e5.5	e5.5	e5.5	6.9	8.3	28	16	7.3	19	8.8
28	e7.5	e5.0	e5.5	e6.0	e5.5	6.7	7.8	44	16	8.1	19	8.4
29	e7.5	e5.0	e5.0	e6.5	---	6.7	8.2	45	15	8.1	19	8.0
30	8.1	e4.5	e5.0	e6.5	---	6.7	7.8	42	15	12	8.6	7.8
31	8.0	---	e4.5	e6.0	---	7.6	---	30	---	9.7	9.3	---
TOTAL	261.0	188.7	161.5	174.0	154.5	208.3	267.9	536.6	857	300.6	271.6	340.3
MEAN	8.42	6.29	5.21	5.61	5.52	6.72	8.93	17.3	28.6	9.70	8.76	11.3
AC-FT	518	374	320	345	306	413	531	1060	1700	596	539	675
MAX	9.4	7.7	6.0	6.5	6.5	8.6	12	45	48	21	19	18
MIN	7.5	4.5	4.5	4.0	4.5	5.5	7.0	7.5	15	5.7	3.1	7.8
CAL YR	2010	TOTAL	6579.5	MEAN	18.0	MAX	121	MIN	3.4	AC-FT	13050	
WTR YR	2011	TOTAL	3722.0	MEAN	10.2	MAX	48	MIN	3.1	AC-FT	7380	

MAX DISCH: 59.7 CFS AT 23:30 ON MAY 28,2011 GH 2.29 FT SHIFT -0.01 FT

MAX GH: 2.29 FT AT 23:30 ON MAY 28,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08242500 UTE CREEK NEAR FORT GARLAND
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08243500 TRINCHERA CREEK BELOW SMITH RESERVOIR
Water Year 2011

Location.-- Lat 37°23'10", long 105°33'6" referenced to North American Datum of 1983 (Blanca, CO quad, scale 1:24,000), UTM Zone 13 451172 E and 4137863 N, in NE ¼ NW ¼ sec. 4, T.31 S., R.73 W., 6th Principal Meridian, Costilla County, CO, Hydrologic Unit 13010002, on right bank 0.6 mi downstream from Smith Reservoir, and 5.0 mi southwest of Blanca, CO.

Drainage Area and Period of Record.-- 396 mi². Oct. 1, 1928 to current year, records mostly complete.

Equipment.-- Graphic water-stage recorder, data collection platform (Sutron Satlink2) and a float-operated shaft encoder in a 42-inch diameter corrugated metal shelter and well. The shaft encoder float is operated in an oil cylinder. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No change.

Hydrologic Conditions.-- Station is located below Smith Reservoir and all but the smallest flows are regulated. There are small springs located below the dam and are reflected in the low flows during the periods the outlet is shut off.

Gage-Height Record.-- Primary record is fifteen minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Dec. 17, 2010 to Mar. 4, 2011 when inlets were frozen. Four shaft encoder corrections and a flush correction were observed and applied. The flush correction of -0.01 ft on Jul. 19, 2011 was taken straight back to inflection point five hours earlier. The shaft encoder corrections, all of plus or minus 0.01 ft, were prorated back to previous visits.

Datum Corrections.-- Levels were not run this year. Levels were last run to the Reference Point inside the gage Aug. 26, 2010 using BM No. 1 as base. The reference point elevation was within allowable limits, so the RP was not corrected.

Rating.-- The control is a concrete weir approximately five feet downstream of the gage. Shifting occurs mainly due to moss growth and the movement of streambed materials in gage pool and approach. Rating No. 12 was used this year. Fifteen measurements (Nos. 868-882) were made this year ranging in discharge from 0.10 to 19.0 cfs. They cover the discharge range experienced except for lower daily flows Nov. 30 – Dec. 4, Dec. 6–9, 12, 2010. The peak flow of 19.6 cfs occurred at 1230 on Apr. 12, 2011 at a gage height of 3.31 ft with a shift of 0.00 ft. The stage equalled high measurement No. 877 made on Jun. 7, 2011 at a GH = 3.31 ft.

Discharge.-- Shifting control method was used for all periods of good record. Shifts were applied as defined by measurements and distributed by time and events. Rocks were noted on the control on Oct. 22 and Jun. 7 and shifts were prorated from the time of deposition on the control. The gage pool was cleaned Aug. 9 with a shift change occurring before the measurement. Measurement shifts ranged from -0.01 to +0.03 ft and all were given full weight.

Special Computations.-- Discharge for periods of no gage-height record was estimated using linear interpolation between four discharge measurements. Winter flows are primarily reservoir seepage and small springs. Winter measurements are poor and no single measurement is given more weight than any other.

Remarks.-- Record is good above 1 cfs, and poor less than 1cfs. Estimated daily discharges less than 1 cfs should be considered poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08243500 TRINCHERA CREEK BELOW SMITH RESERVOIR

RATING TABLE-- TRISMICO12 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

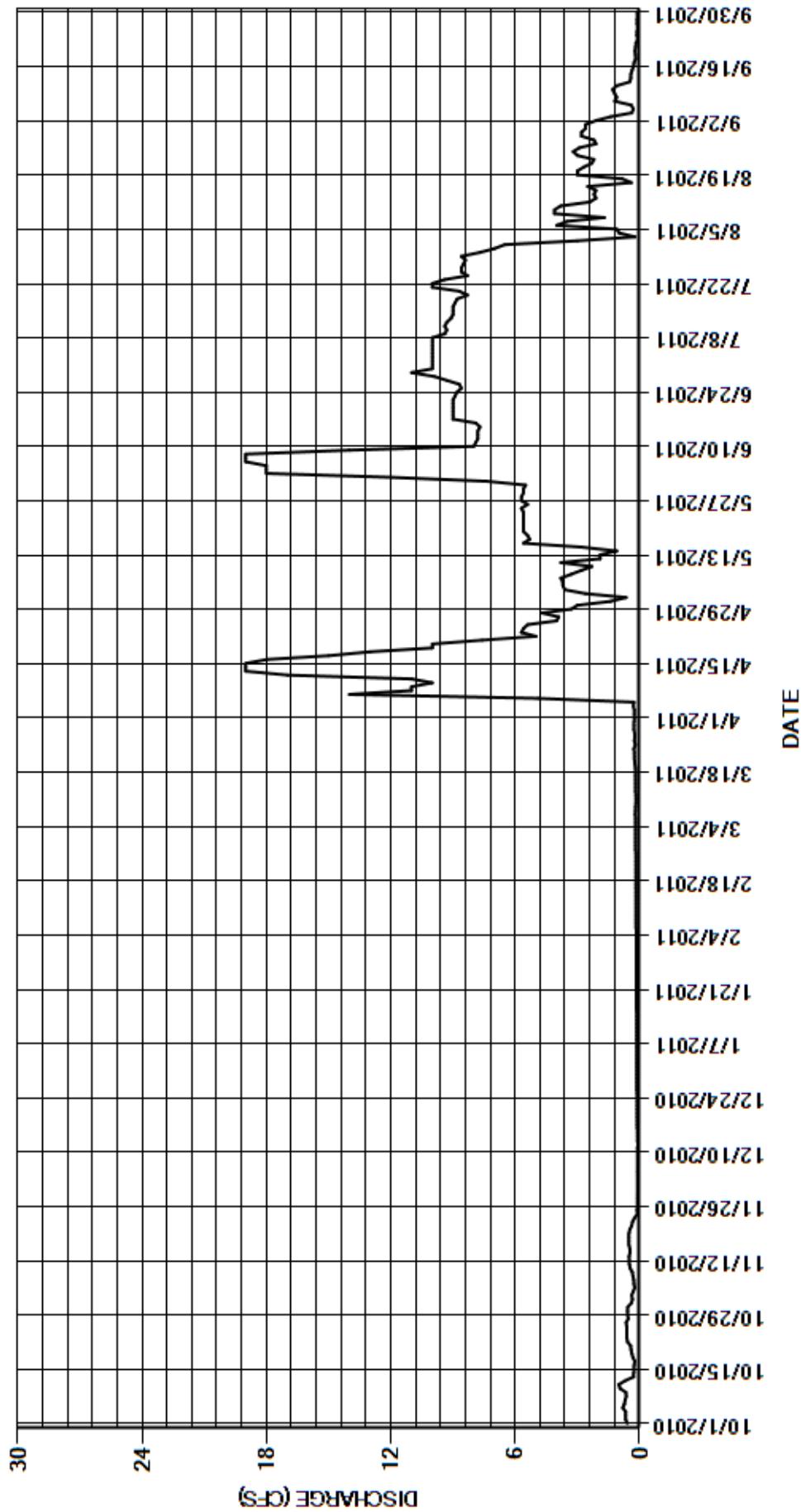
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.59	0.40	0.09	e0.13	e0.16	e0.19	0.25	1.4	7.4	10	6.5	2.6
2	0.67	0.34	0.09	e0.13	e0.16	e0.19	0.26	0.65	12	10	3.0	2.1
3	0.67	0.38	0.09	e0.13	e0.16	e0.19	0.25	2.6	18	10	0.22	1.4
4	0.67	0.31	0.09	e0.13	e0.16	e0.19	0.30	3.6	18	10	0.98	0.37
5	0.81	0.23	0.10	e0.13	e0.16	0.19	0.27	3.7	18	10	1.1	0.30
6	0.73	0.27	0.09	e0.14	e0.17	0.19	4.9	3.7	19	10	4.0	0.40
7	0.70	0.28	0.09	e0.14	e0.17	0.21	14	3.8	19	10	3.5	1.2
8	0.64	0.32	0.09	e0.14	e0.17	0.20	11	3.3	19	10	1.7	1.1
9	0.66	0.35	0.09	e0.14	e0.17	0.19	11	2.8	14	9.4	4.1	1.2
10	0.94	0.45	0.10	e0.14	e0.17	0.18	10	2.3	8.0	9.3	4.1	1.3
11	1.0	0.49	0.10	e0.14	e0.17	0.17	11	3.8	7.9	9.4	3.8	1.1
12	0.70	0.49	0.08	e0.14	e0.17	0.18	17	1.9	7.8	9.3	2.4	0.47
13	0.28	0.51	0.10	e0.14	e0.17	0.19	19	1.9	7.8	9.1	2.1	0.42
14	0.28	0.46	0.10	e0.14	e0.17	0.19	19	1.1	7.8	9.0	2.2	0.42
15	0.27	0.47	0.10	e0.14	e0.17	0.19	19	2.8	7.7	9.0	2.1	0.36
16	0.26	0.51	0.11	e0.15	e0.18	0.19	18	5.6	7.9	9.0	2.5	0.29
17	0.23	0.51	e0.11	e0.15	e0.18	0.20	15	5.3	9.0	8.9	0.39	0.26
18	0.32	0.51	e0.11	e0.15	e0.18	0.20	13	5.4	9.0	8.8	0.84	0.18
19	0.37	0.51	e0.12	e0.15	e0.18	0.20	10	5.6	9.0	8.3	3.0	0.20
20	0.41	0.47	e0.12	e0.15	e0.18	0.22	10	5.6	9.0	8.7	3.0	0.22
21	0.43	0.38	e0.12	e0.15	e0.18	0.24	7.6	5.6	9.0	10	2.7	0.19
22	0.58	0.34	e0.12	e0.15	e0.18	0.24	5.0	5.6	9.0	10	2.3	0.17
23	0.61	0.24	e0.12	e0.15	e0.18	0.25	5.7	5.6	8.9	9.4	2.2	0.09
24	0.61	0.10	e0.12	e0.15	e0.18	0.27	5.6	5.6	8.8	8.3	3.0	0.13
25	0.62	0.12	e0.12	e0.15	e0.18	0.20	5.4	5.7	8.6	8.6	3.2	0.12
26	0.62	0.10	e0.13	e0.16	e0.19	0.25	4.0	5.4	8.7	8.6	2.9	0.09
27	0.65	0.10	e0.13	e0.16	e0.19	0.23	3.9	5.7	9.3	8.5	2.1	0.12
28	0.54	0.10	e0.13	e0.16	e0.19	0.24	4.7	5.7	9.9	8.4	2.2	0.12
29	0.58	0.10	e0.13	e0.16	---	0.27	3.3	5.6	11	8.6	2.8	0.10
30	0.58	0.09	e0.13	e0.16	---	0.26	3.0	5.6	10	7.7	2.8	0.13
31	0.57	---	e0.13	e0.16	---	0.26	---	5.5	---	7.0	2.6	---
TOTAL	17.59	9.93	3.35	4.51	4.87	6.56	251.43	128.45	328.5	283.3	80.33	17.15
MEAN	0.57	0.33	0.11	0.15	0.17	0.21	8.38	4.14	11.0	9.14	2.59	0.57
AC-FT	35	20	6.6	8.9	9.7	13	499	255	652	562	159	34
MAX	1.0	0.51	0.13	0.16	0.19	0.27	19	5.7	19	10	6.5	2.6
MIN	0.23	0.09	0.08	0.13	0.16	0.17	0.25	0.65	7.4	7.0	0.22	0.09
CAL YR	2010	TOTAL	4741.08	MEAN	13.0	MAX	137	MIN	0.08	AC-FT	9400	
WTR YR	2011	TOTAL	1135.97	MEAN	3.11	MAX	19	MIN	0.08	AC-FT	2250	

MAX DISCH: 19.6 CFS AT 12:30 ON APR 12,2011 GH 3.31 FT SHIFT 0 FT

MAX GH: 3.33 FT AT 08:30 ON JUN 06,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08243500 TRINCHERA CREEK BELOW SMITH RESERVOIR
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08245000 CONEJOS RIVER BELOW PLATORO RESERVOIR
Water Year 2011

Location.-- Lat 37°21'18", long 106°32'39" referenced to North American Datum of 1983 (Platoro, CO quad, scale 1:24,000), UTM Zone 13 363240 E and 4135374 N, in SW ¼ NW ¼ sec. 22, T.36 N., R.4 E., New Mexico Principal Meridian, Conejos County, CO, Hydrologic Unit 13010005, on left bank 1,100 ft downstream from Platoro Reservoir valve house and 0.7 mi northwest of Platoro, CO.

Drainage Area and Period of Record.-- 40 mi². May 1952 to current year.

Equipment.-- Graphic water stage recorder, data collection platform (Sutron 8210 DCP with HDR GOES radio), a float-operated shaft encoder, and air temperature sensor in a timber shelter and concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. Cableway located 150 feet below gaging station. No changes this water year.

Hydrologic Conditions.-- Gage is below Platoro Reservoir and regulated at all stages.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Nov. 17, 2010 through March 31, 2011 when the station was closed for the winter. A -0.23 ft correction was applied from March 31 to April 8 and April 11 to April 15 , 2011 when the gage-height was affected by snowmelt from around gage flowing into the well faster than lower inlet could expel it. A +0.01 ft instrument correction was made to the shaft encoder on Aug. 18, 2011 and was prorated from the previous visit.

Datum Corrections.-- Levels were not run this year. Levels were last run on August 18, 2009, using BM 1 as base. The RP was within allowable limits, so no correction was made or required.

Rating.-- A concrete slab weir with sloping sides acts as the control. Rating No. 14 was used before the reservoir was shut down for the winter and Rating No. 15-1 was created and used once the reservoir was opened up in the spring. This rating is well defined from 7 to 825 cfs. Thirteen measurements (Nos. 880-892) were made this year ranging in discharge from 4.85 to 810 cfs. Measurements cover the discharge range experienced. The peak flow 818 cfs occurred at 1115 on Jun. 14, 2011 at a gage height of 3.39 ft. with a shift of +0.02 ft. It exceeded high measurement No. 887 (GH = 3.38) by 0.01 ft. in stage.

Discharge.-- Shifting control method was used for all periods of good record. A variable shift curve (CONPLAVS1105) was used Mar. 31 - Sep. 30, 2011. During other periods, shifts were applied as defined by measurements and distributed by time. Excluding the measurement on March 31, 2011, measurement shifts ranged from -0.03 ft to +0.08 ft. All measurements were given full weight except numbers 884-886, 888-891, which were adjusted as much as 6 percent to smooth shift distribution.

Special Computations.-- Discharge for the period of no gage-height record was estimated using measurements and partial day records.

Remarks.-- Record is good except for period of no gage-height record, which is poor; and the period of Apr. 1-19 which is considered poor since there was some uncertainty in gage-heights due to snowmelt water running into well. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.-- Levels should be shot in 2012.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08245000 CONEJOS RIVER BELOW PLATORO RESERVOIR

RATING TABLE-- CONPLACO14 USED FROM 01-OCT-2010 TO 31-DEC-2010
CONPLACO15-1 USED FROM 01-JAN-2011 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

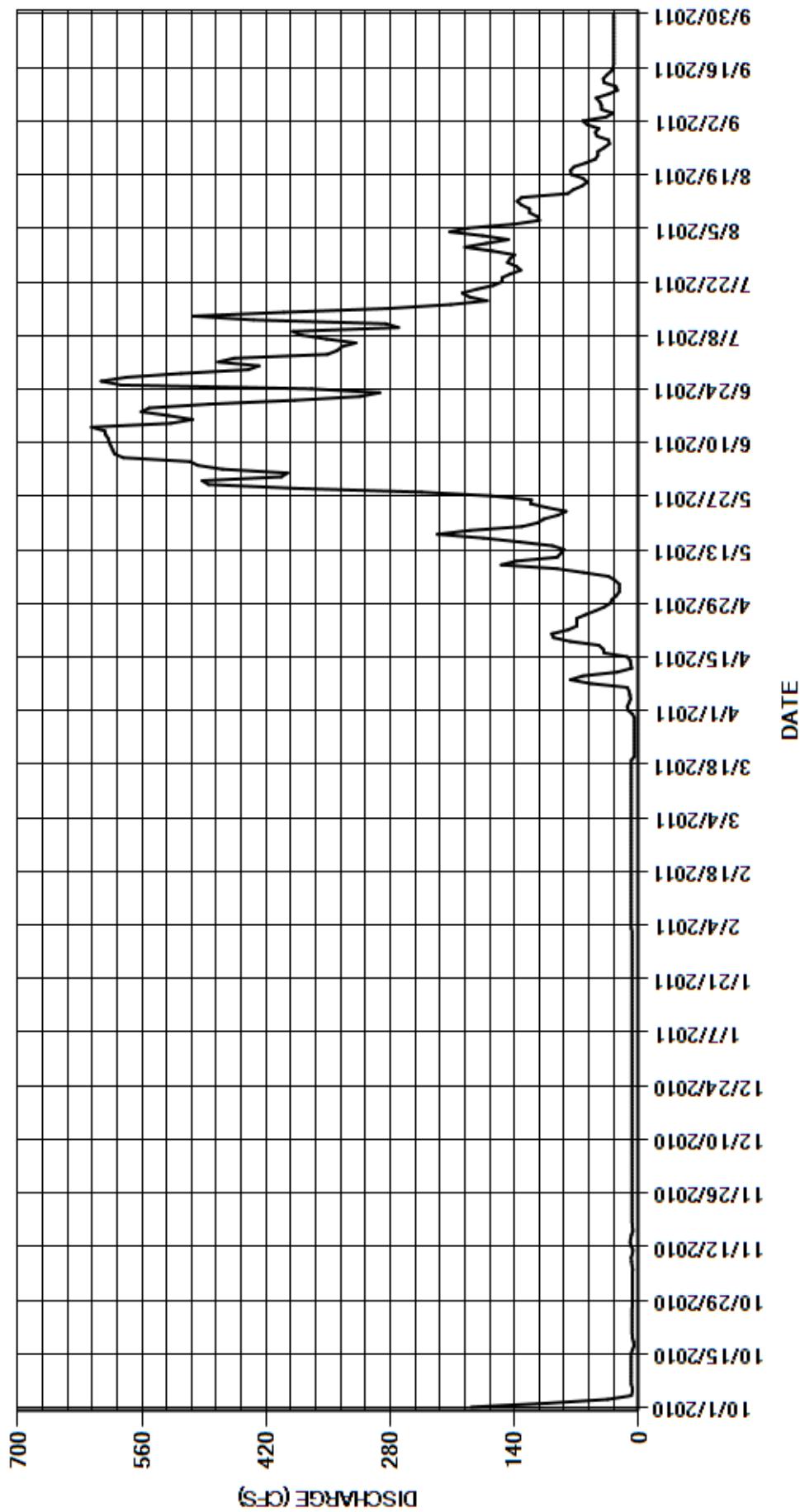
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	189	7.1	e7.4	e7.4	e7.4	e8.3	12	25	403	474	172	58
2	103	7.1	e7.4	e7.4	e7.4	e8.3	13	22	396	456	147	63
3	35	7.1	e7.4	e7.4	e8.3	e8.3	11	22	469	351	176	37
4	8.3	7.1	e7.4	e7.4	e8.3	e8.3	9.1	22	497	340	213	29
5	7.3	7.3	e7.4	e7.4	e8.3	e8.3	10	27	506	335	192	42
6	7.3	6.8	e7.4	e7.4	e8.3	e8.3	11	34	581	319	141	42
7	8.4	7.6	e7.4	e7.4	e8.3	e8.3	13	62	591	352	112	44
8	8.4	8.1	e7.4	e7.4	e8.3	e8.3	54	92	593	380	114	48
9	8.4	8.5	e7.4	e7.4	e8.3	e8.3	77	155	595	390	123	34
10	8.3	7.3	e7.4	e7.4	e8.3	e8.3	63	138	597	271	123	24
11	8.4	6.5	e7.4	e7.4	e8.3	e8.3	24	92	598	285	132	26
12	8.4	8.2	e7.4	e7.4	e8.3	e8.3	7.9	88	601	434	137	39
13	8.4	9.7	e7.4	e7.4	e8.3	e8.3	9.0	84	602	502	132	40
14	8.4	9.1	e7.4	e7.4	e8.3	e8.3	9.5	97	617	400	80	36
15	8.4	8.1	e7.4	e7.4	e8.3	e8.3	13	134	527	282	74	31
16	7.1	6.6	e7.4	e7.4	e8.3	e8.3	39	175	503	212	64	29
17	5.3	e7.1	e7.4	e7.4	e8.3	e8.3	40	227	530	171	58	28
18	5.8	e7.4	e7.4	e7.4	e8.3	e8.3	45	190	561	191	63	28
19	7.0	e7.4	e7.4	e7.4	e8.3	e8.3	77	132	552	199	76	28
20	7.4	e7.4	e7.4	e7.4	e8.3	e4.8	96	114	484	183	77	28
21	7.4	e7.4	e7.4	e7.4	e8.3	e4.8	98	107	388	164	73	28
22	7.4	e7.4	e7.4	e7.4	e8.3	e4.8	80	91	314	154	60	28
23	7.4	e7.4	e7.4	e7.4	e8.3	e4.8	70	82	292	154	49	28
24	7.4	e7.4	e7.4	e7.4	e8.3	e4.8	70	104	369	145	46	28
25	7.5	e7.4	e7.4	e7.4	e8.3	e4.8	70	122	584	133	46	28
26	7.4	e7.4	e7.4	e7.4	e8.3	e4.8	60	121	606	138	39	28
27	7.4	e7.4	e7.4	e7.4	e8.3	e4.8	49	165	578	148	33	28
28	7.1	e7.4	e7.4	e7.4	e8.3	e4.8	39	245	516	145	34	28
29	7.1	e7.4	e7.4	e7.4	---	e4.8	32	388	440	140	47	28
30	7.1	e7.4	e7.4	e7.4	---	e4.8	30	485	428	165	49	28
31	7.1	---	e7.4	e7.4	---	e7.0	---	492	---	196	45	---
TOTAL	538.3	225.5	229.4	229.4	230.6	217.5	1231.5	4334	15318	8209	2927	1014
MEAN	17.4	7.52	7.40	7.40	8.24	7.02	41.0	140	511	265	94.4	33.8
AC-FT	1070	447	455	455	457	431	2440	8600	30380	16280	5810	2010
MAX	189	9.7	7.4	7.4	8.3	8.3	98	492	617	502	213	63
MIN	5.3	6.5	7.4	7.4	7.4	4.8	7.9	22	292	133	33	24
CAL YR	2010	TOTAL	31842.4	MEAN	87.2	MAX	422	MIN	5.3	AC-FT	63160	
WTR YR	2011	TOTAL	34704.2	MEAN	95.1	MAX	617	MIN	4.8	AC-FT	68840	

MAX DISCH: 818 CFS AT 11:15 ON JUN 14,2011 GH 3.39 FT SHIFT 0.02 FT

MAX GH: 3.39 FT AT 11:15 ON JUN 14,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08245000 CONEJOS RIVER BELOW PLATERO RESERVOIR
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08246500 CONEJOS RIVER NEAR MOGOTE
Water Year 2011

Location.--	Lat. 37°03'14", Long. 106°11'13", UTM X 394411.1, Y 4101511.0, in SE 1/4 SE 1/4 sec. 34, T.33 N., R.7 E., Conejos County, Hydrologic Unit 13010005, on left bank 75 ft downstream from bridge on State Highway 174, 0.4 mi downstream from Fox Creek, 5.3 mi west of Mogote, and 10 mi west of Antonito.
Drainage Area and Period of Record.--	282 mi ² . April 1903 to October 1905, October 1911 to current year. Monthly discharge only for some periods. Records for March 1900 at site 5.5 mi upstream and May 1905 to September 1911 (some missing periods most years) at site 3.2 mi upstream not equivalent to present site due to inflow.
Equipment.--	Graphic water-stage recorder, data collection platform (Sutron Model 8210 DCP with HDR GOES radio and phone modem) and a float-operated shaft encoder, air temperature sensor, and tipping bucket rain gauge in a 5 ft. diameter metal shelter and well. On-site AC-power provides electricity for heat lamp to prevent well from freezing in winter. The primary reference gage is a drop tape from reference point on shelf. Outside gage is a cantilever wire weight gage located on the upstream side of shelter, established May 26, 2011.
Hydrologic Conditions.--	Flows partially regulated by Platoro Reservoir (capacity 60,000 acre-feet) and a few other minor reservoirs. Flood irrigation of approximately 225 acres of pasture grass may have a minor impact on flows at gage, 2005 CDSS irrigated area. Drainage area is predominantly undeveloped national forest.
Gage-Height Record.--	Primary record is 15-minute satellite transmitted stage data with electronic DCP log and chart record as backup. Record is complete and reliable. The stage-discharge relationship was affected by ice on the control Nov 10-30, Dec 1-16, 25-31, 2010; Jan 1-31, Feb 1-28, Mar 1, 5, 6, 2011. Two erroneous unit values were filled from chart record on May 5, 2011. There were four instrument calibrations made ranging from -0.01 to +0.02 feet. These corrections were applied when observed and prorated back to the previous visit.
Datum Corrections.--	Levels were ran September 27, 2011. All existing reference marks were stable and within allowable tolerance. Outside wire-weight gage was set to gage datum. No other adjustments were made. Two-peg tests were performed on the instrument on May 27, Jul. 28, and Sep. 26, 2011. The instrument was adjusted slightly on Sep. 26, 2011.
Rating.--	Low flow control is a cobblestone riffle approximately fifty feet below the gage and medium to high flows are channel control. Rating No. 13, in use since March 3, 2008, was used for the entire water year. It is well defined from 10 to 2100 cfs. The rating was extended to 9200 cfs using the high end of the results of a cooperative rating curve extension project using step-backwater analysis method with the USGS in 2002. Twenty-seven measurements (Nos. 201-227) were made this year ranging in discharge from 13.3 to 1,750 cfs. The measurements cover the discharge range experienced. The peak flow of 1850 cfs occurred at 0615 on June 7, 2011 at a gage height of 5.08 feet with a shift of -0.04 ft. It exceeded high measurement No. 220 (GH=4.97 ft), made June 7, 2011 by 0.11 feet in stage.
Discharge.--	Shifting control method was used during all periods of good record. The stage-discharge relation was affected by ice Nov. 10 to Dec. 16, Dec. 25, 2010 to Mar. 1, and Mar. 5-6, 2011 and was estimated. Shifts were applied as defined by discharge measurements and distributed by time, except for the period of Jun. 20 to Aug. 1, 2011 when the shift curve CONMOGVS11-1 was used to apply shifts by stage. The shift change between measurements 220 and 221 from -0.04 ft to +0.03 ft is likely due to debris movement out of the channel after high water since lower flow shifts do not indicate a change. Measurements show shifts varied from -0.06 to +0.07 feet. All were given full weight except for Nos. 202, 204, 218, 219, and 227 which were adjusted as much as 5% to smooth shift distribution.
Special Computations.--	Discharge for periods of ice-affected record was estimated using eight discharge measurements, weather records, partial day record, and comparison with nearby stations. The calculated discharge values on Oct. 2, 28, Nov. 2, 2010 were adjusted by +/- 1 cfs in order for the 2011 Water Year values to match the final 2010 Calendar Year values. The small discrepancies are due to mathematical differences between the old system using hourly average values and the new system using 15-minute unit values for daily mean discharge calculation.
Remarks.--	Record is good except for periods of ice-affected record, which are poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08246500 CONEJOS RIVER NEAR MOGOTE

RATING TABLE-- CONMOGCO13 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

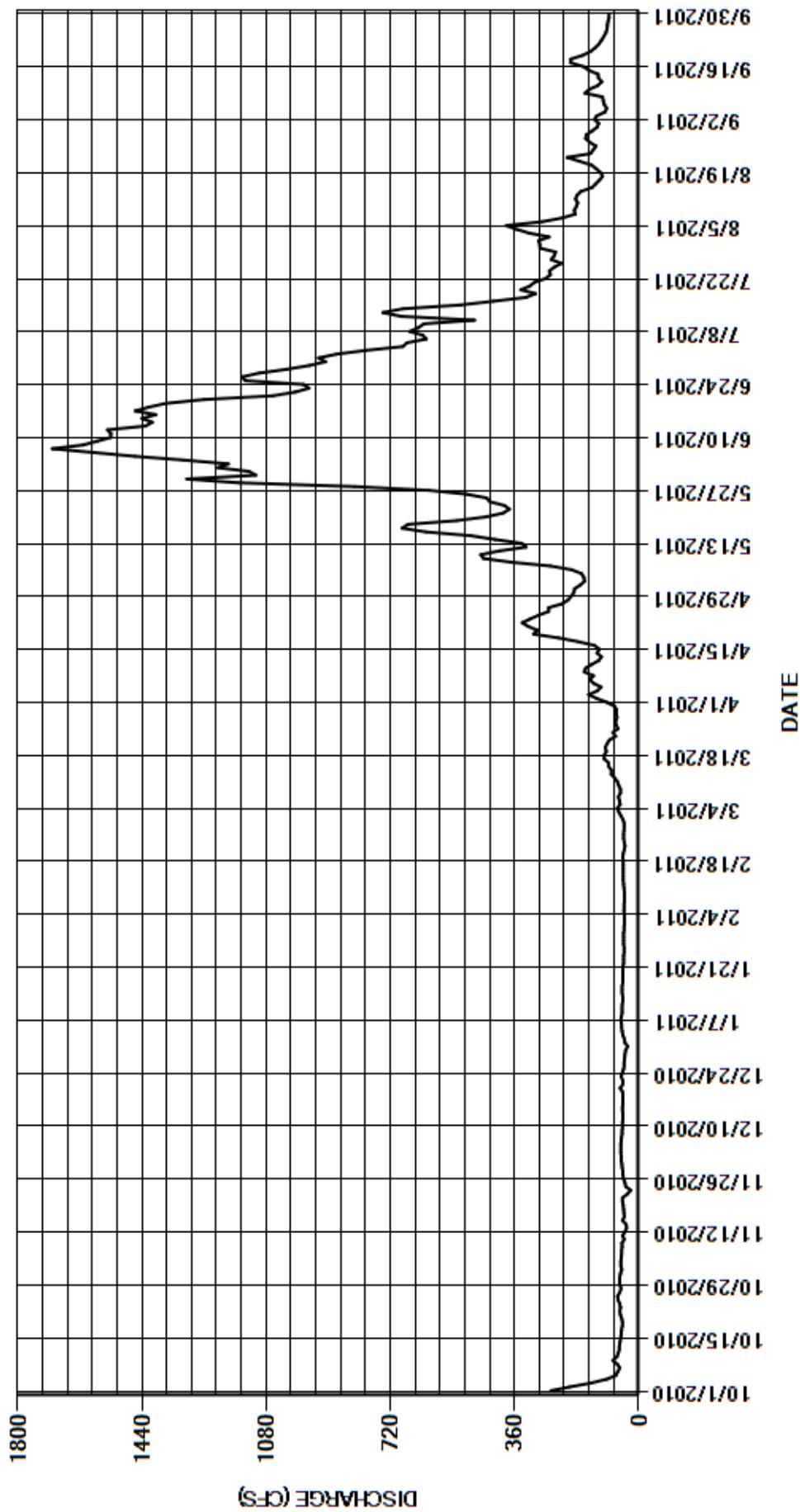
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	255	53	e51	e40	e42	e46	93	186	1130	928	290	116
2	200	49	e51	e42	e41	52	122	169	1220	876	260	128
3	139	52	e52	e46	e41	58	145	157	1190	791	318	122
4	94	52	e52	e48	e42	62	120	159	1320	684	354	98
5	67	51	e52	e50	e43	e54	109	166	1460	672	384	93
6	61	50	e51	e50	e42	e56	131	194	1580	616	281	100
7	55	50	e50	e52	e42	59	142	256	1700	626	222	103
8	62	48	e48	e50	e41	53	131	369	1610	664	184	105
9	75	49	e48	e48	e41	53	158	450	1570	639	187	156
10	63	e42	e47	e48	e42	58	154	458	1530	623	181	143
11	59	e47	e47	e48	e43	62	136	403	1530	476	177	119
12	56	e40	e46	e46	e44	70	116	327	1540	689	183	107
13	56	e35	e46	e46	e45	80	108	339	1430	742	179	117
14	54	e37	e47	e48	e45	79	121	416	1410	683	168	118
15	52	e47	e47	e48	e45	87	114	486	1440	516	136	144
16	51	e42	e46	e48	e45	88	128	616	1400	421	125	160
17	50	e43	46	e46	e45	100	175	686	1460	327	114	197
18	48	e44	46	e46	e45	100	233	669	1420	299	105	197
19	47	e45	47	e46	e46	94	305	527	1370	342	111	162
20	49	e47	54	e46	e45	97	293	442	1260	316	123	140
21	53	e47	46	e46	e42	92	320	393	1060	302	137	126
22	55	e33	46	e44	e40	85	338	375	995	270	172	115
23	53	e23	51	e44	e42	67	315	389	956	256	208	108
24	55	e38	48	e44	e44	75	290	432	972	259	140	101
25	60	e40	e44	e42	e44	60	261	441	1140	245	132	95
26	61	e44	e42	e42	e43	66	261	501	1150	224	124	92
27	55	e46	e42	e44	e42	67	222	608	1100	254	142	91
28	51	e46	e41	e44	e42	63	205	824	1020	245	154	89
29	55	e48	e40	e44	---	65	196	1160	955	241	152	86
30	56	e49	e38	e44	---	64	188	1310	908	286	135	86
31	55	---	e32	e42	---	71	---	1110	---	287	121	---
TOTAL	2202	1337	1444	1422	1204	2183	5630	15018	38826	14799	5699	3614
MEAN	71.0	44.6	46.6	45.9	43.0	70.4	188	484	1294	477	184	120
AC-FT	4370	2650	2860	2820	2390	4330	11170	29790	77010	29350	11300	7170
MAX	255	53	54	52	46	100	338	1310	1700	928	384	197
MIN	47	23	32	40	40	46	93	157	908	224	105	86
CAL YR	2010	TOTAL	100036	MEAN	274	MAX	2090	MIN	23	AC-FT	198400	
WTR YR	2011	TOTAL	93378	MEAN	256	MAX	1700	MIN	23	AC-FT	185200	

MAX DISCH: 1850 CFS AT 06:15 ON JUN 07,2011 GH 5.08 FT SHIFT -0.04 FT

MAX GH: 5.08 FT AT 06:15 ON JUN 07,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08246500 CONEJOS RIVER NEAR MOGOTE
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08247500 SAN ANTONIO RIVER AT ORTIZ
Water Year 2011

Location.--	Lat 36°59'35", long 106°2'17" referenced to North American Datum of 1983 (Los Pinos, NM quad, scale 1:24,000), UTM Zone 13 407628 E and 4094606 N, in L1 1/4 SE 1/4 sec. 24, T.32 N., R.8 E., New Mexico Principal Meridian, Rio Arriba County, NM, Hydrologic Unit 13010005, on left bank 800 ft south of Colorado-New Mexico State line, 0.4 mi southeast of Ortiz, CO, and 0.4 mi upstream from Los Pinos River.
Drainage Area and Period of Record.--	110 mi ² . April 1919 to current year (no winter record prior to 1941). Monthly data only for some periods.
Equipment.--	Graphic water-stage recorder, data collection platform (Sutron Satlink2) and a float-operated shaft encoder in a 42-inch metal pipe shelter and well. The shaft encoder float is operated in an oil cylinder. The primary reference gage is a drop tape from reference point on shelf. A cantilever staff gage was installed on May 4, 2011. Bank operated cableway installed October 2010.
Hydrologic Conditions.--	Basin is alpine and predominately subalpine terrain. Minor diversions affect flows at gage.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Jan. 23 – Mar. 15, due to well, oil cylinder, and/or inlets freezing. The stage-discharge relation was affected Oct. 1- 25, 2010 when the control was submerged due to beavers and/or destroyed. The stage-discharge relation was affected by ice Nov. 10, 2010 to Jan. 22, 2011. Numerous instrument corrections were made to the shaft encoder ranging from -0.02 to +0.01 ft and corrections of +0.05 and +0.10 ft due to oil cylinder leakage. The +0.05 ft correction on Nov. 15 was prorated back to the previous visit because the point of leakage was not identifiable. The correction of +0.11 ft on Jul. 1, 2011 was distributed from a point on June 24, 2011 where comparison with chart recorder data indicates the oil cylinder started draining out. All others were prorated by time from previous visit. One cleaning correction on September 15, 2011 was applied as a datum correction to simplify shift distribution.
Datum Corrections.--	Levels were run to the Reference Point (RP) inside the gage on Sept. 27, 2011 using B.M. No. 4 as base. The gage was within allowable limits no correction was required or made. Two-peg test was performed on the Lietz level (SN 130869) on Sept. 26, 2011, a 0.0017 adjustment was made to bring level back into tolerances.
Rating.--	Prior to October 20, 2010 control consisted of two shifting gravel bars approximately 50 feet and 100 feet below the gage and the channel at higher stages. Rating 16-2 was developed using measurements from WY2010 which included high flow measurement number 78 at a stage of 3.80 ft, and discharge of 336 cfs. Although rating 16-2 was fairly well defined, the control at the site was destroyed sometime during a no-flow period in September WY 2010 and was rebuilt with rock on Oct. 20-21, 2010. A new rating (SANORTCO 17-1) was developed using measurements from this water year and used beginning March 15, 2011 when the gage was opened. Rating SANORTCO 17-1 is fairly well defined up to 100 cfs and poorly defined above 100 cfs. Thirty-two measurements (Nos. 91-122) were made this year, ranging in discharge from 0 to 87.9 cfs. The measurements cover the discharge range experienced except for higher daily flows on May 8 and 9, 2011. The peak flow of 145 cfs occurred at 0730 on May 9, 2011 at a gage height of 2.85 feet with a shift of -0.01 feet. It exceeded high measurement No. 111 (GH=2.40), made May 10, 2011 by 0.45 feet in stage.
Discharge.--	Shifting control method was used during all periods of good record. The stage-discharge relation was affected Oct. 1- 25, 2010 when the control was submerged due to beavers and/or destroyed. All were flagged as "c" days and estimated although some days were not submerged, just no stage-discharge relationship was defined. The stage-discharge relation was affected by ice Nov. 10, 2010 to Jan. 22, 2011 and estimated. Variable shift curves were used Jun. 1-22, Jun. 24 - Sep. 1, 2011 and Sep. 1- Sep. 27, 2011. Measurements show shifts ranged from -0.51 to -0.14 feet while rating SANORTCO16-2 was in use and -0.03 to +0.23 (+0.36 estimated) feet while SANORTCO17-1 was used. All open water measurements were given full weight and applied except for Nos. 106, 108, 110, and 112 which were adjusted as much as 4% to smooth shift distribution. Measurement 122 was rated fair and adjusted 8%. There was no flow Jul. 3-28, Aug. 1-4, 13-20, 2011 (38 days). One cleaning correction of -0.08 ft was taken as an instrument correction on Sep. 15, 2011 and prorated from previous visit since a shift curve was in use during the same period. Two other cleaning corrections, a -0.07 ft on Nov. 15, 2010 and a -0.05 ft on Jun. 24, 2011 were accounted for in the shift and prorated from previous visits.
Special Computations.--	Discharge for periods of no gage-height and ice affected record was estimated using discharge measurements, weather records, partial day records, and hydrographic comparison with the station 'Los Pinos River near Ortiz'. Discharge for periods of submergence and no stable stage-discharge relationship estimated by site observations and shifts from previous rating.
Remarks.--	Record is good except for estimated daily discharges, which are poor. Periods of flow less than 2.5 cfs from Jun. 1 to Sep. 30 should be considered poor due to lack of definition in this part of rating. The peak discharge should be considered poor due to lack of high measurements defining upper end of rating. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	High flow measurements are needed to define upper end of rating.

STATE OF COLORADO
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08247500 SAN ANTONIO RIVER AT ORTIZ

RATING TABLE-- SANORTCO16-2 USED FROM 01-OCT-2010 TO 15-MAR-2011
SANORTCO17-1 USED FROM 15-MAR-2011 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

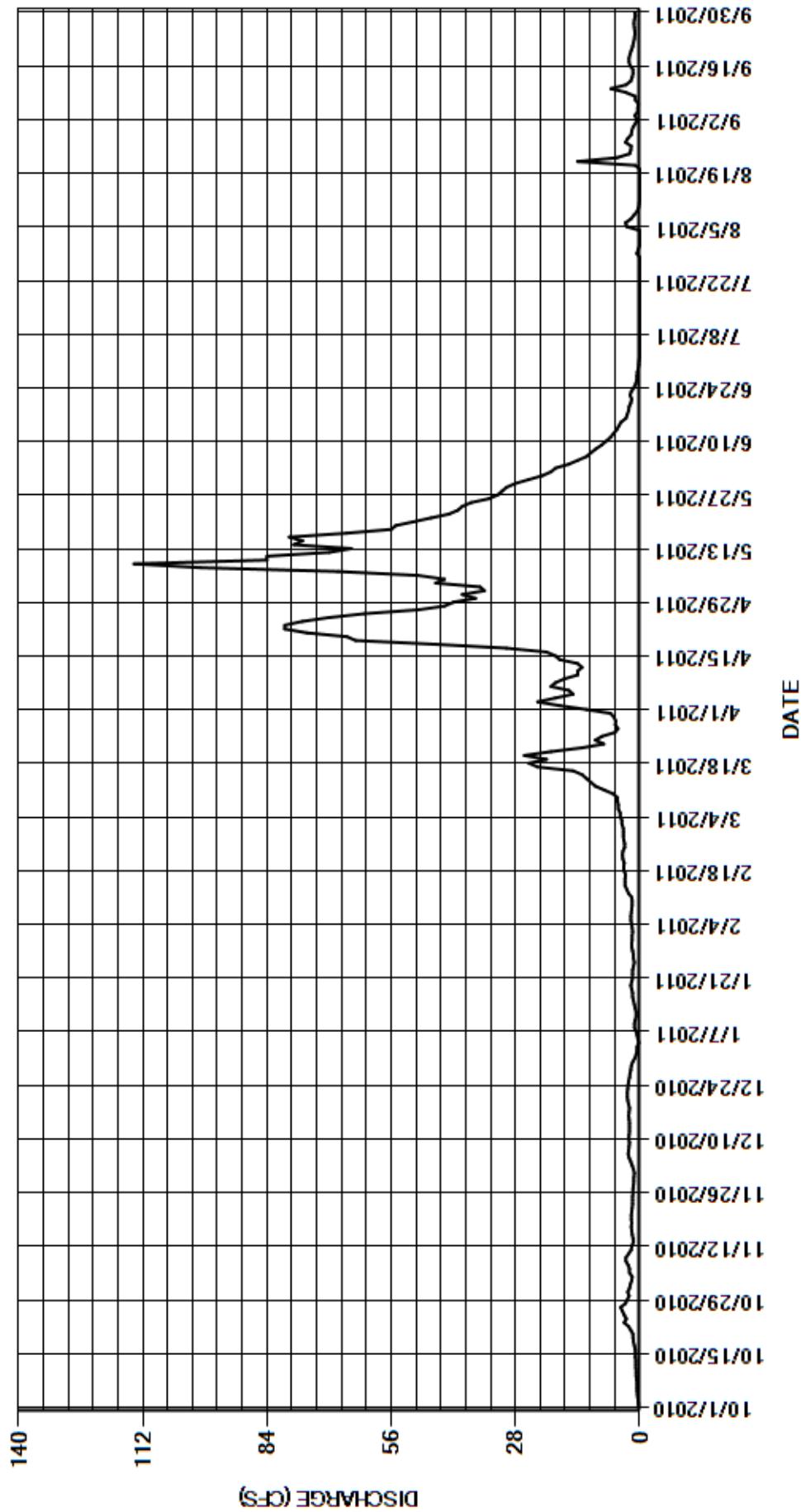
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e0.25	2.3	e1.2	e0.80	e1.7	e3.7	12	40	22	0.12	0.00	0.91
2	e0.30	2.1	e1.4	e0.60	e1.6	e4.0	18	35	20	0.01	0.00	0.63
3	e0.40	1.8	e1.7	e0.60	e1.7	e4.0	23	36	19	0.00	0.00	1.1
4	e0.50	1.7	e2.0	e0.20	e1.8	e4.4	19	46	16	0.00	0.00	0.44
5	e0.60	2.3	e2.4	e0.40	e2.0	e4.4	15	44	14	0.00	2.9	0.43
6	e0.60	2.3	e2.6	e0.60	e2.0	e4.8	16	50	12	0.00	3.2	0.30
7	e0.60	2.6	e2.5	e0.80	e1.9	e4.8	20	68	11	0.00	2.0	0.94
8	e0.70	3.1	e2.4	e1.2	e1.8	e5.0	19	99	9.9	0.00	1.3	1.0
9	e0.80	3.1	e2.3	e1.2	e1.7	e5.0	17	114	8.6	0.00	0.57	3.1
10	e0.80	e2.5	e2.5	e1.0	e1.7	e6.0	14	84	7.6	0.00	0.22	6.5
11	e0.85	e1.9	e2.4	e0.80	e1.8	e8.0	14	84	6.6	0.00	0.07	3.1
12	e0.85	e1.8	e2.3	e0.80	e2.5	e10	13	70	5.9	0.00	0.03	2.0
13	e0.85	e1.4	e2.3	e1.0	e2.9	e11	14	65	5.2	0.00	0.00	1.7
14	e1.0	e1.5	e2.3	e1.2	e3.3	e12	18	78	4.7	0.00	0.00	1.5
15	e0.95	e1.7	e2.4	e1.4	e3.3	e13	19	76	4.2	0.00	0.00	1.5
16	e1.0	e1.8	e2.5	e1.6	e3.3	15	21	79	3.1	0.00	0.00	2.2
17	e1.2	e1.9	e2.4	e1.6	e3.2	23	30	66	2.8	0.00	0.00	2.4
18	e1.4	e1.8	e2.3	e1.8	e3.6	25	46	56	2.5	0.00	0.00	2.4
19	e1.5	e1.9	e2.5	e2.0	e3.6	21	64	55	2.4	0.00	0.00	2.2
20	e1.5	e1.9	e2.7	e1.8	e3.5	26	66	51	2.0	0.00	0.00	1.9
21	e2.0	e1.8	e2.8	e1.6	e3.8	20	75	47	1.8	0.00	0.99	1.6
22	e2.5	e1.7	e2.8	e1.6	e3.9	13	80	43	2.2	0.00	14	1.4
23	e3.5	e1.6	e2.7	e1.6	e3.8	8.1	80	41	1.9	0.00	5.1	1.2
24	e3.0	e1.6	e2.6	e1.4	e3.4	10	76	40	1.3	0.00	2.3	1.1
25	e3.5	e1.6	e2.5	e1.2	e3.4	8.5	70	38	0.90	0.00	2.0	1.1
26	3.9	e1.5	e2.3	e1.4	e3.6	5.6	62	34	0.68	0.00	1.9	1.2
27	4.3	e1.5	e2.2	e1.4	e3.7	4.9	50	32	0.64	0.00	3.2	1.3
28	3.2	e1.4	e2.0	e1.6	e3.7	5.5	44	31	0.53	0.00	2.7	1.2
29	2.8	e1.3	e1.9	e1.8	---	5.4	42	30	0.33	0.65	1.9	1.0
30	2.4	e1.3	e1.6	e1.8	---	5.8	37	28	0.18	0.32	1.8	1.1
31	2.7	---	e1.1	e1.7	---	6.6	---	25	---	0.03	1.5	---
TOTAL	50.45	56.7	69.6	38.50	78.2	303.5	1094	1685	189.96	1.13	47.68	48.45
MEAN	1.63	1.89	2.25	1.24	2.79	9.79	36.5	54.4	6.33	0.036	1.54	1.62
AC-FT	100	112	138	76	155	602	2170	3340	377	2.2	95	96
MAX	4.3	3.1	2.8	2.0	3.9	26	80	114	22	0.65	14	6.5
MIN	0.25	1.3	1.1	0.20	1.6	3.7	12	25	0.18	0.00	0.00	0.30
CAL YR	2010	TOTAL	9987.20	MEAN	27.4	MAX	629	MIN	0.00	AC-FT	19810	
WTR YR	2011	TOTAL	3663.17	MEAN	10.0	MAX	114	MIN	0.00	AC-FT	7270	

MAX DISCH: 145 CFS AT 07:30 ON MAY 09,2011 GH 2.85 FT SHIFT -0.01 FT (Poor due to undefined upper end of rating)

MAX GH: 2.85 FT AT 07:30 ON MAY 09,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08247500 SAN ANTONIO RIVER AT ORTIZ
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08248000 LOS PINOS RIVER NEAR ORTIZ
Water Year 2011

Location.--	Lat 36°58'56", long 106°4'25" referenced to North American Datum of 1983 (Los Pinos, NM quad, scale 1:24,000), UTM Zone 13 404448 E and 4093440 N, in SW ¼ NW ¼ sec. 26, T.32 N., R.8 E., New Mexico Principal Meridian, Rio Arriba County, NM, Hydrologic Unit 13010005, on left bank 0.9 mi south of Colorado-New Mexico State line, 2.1 mi southwest of Ortiz, CO, and 2.9 mi upstream from mouth.
Drainage Area and Period of Record.--	167 mi ² . Jan. 1915 to present.
Equipment.--	Data collection platform (Sutron Satlink 2) and shaft encoder in a 42 inch metal pipe shelter and stilling well. Graphic water -stage recorder as backup. The shaft encoder float is operated in an oil cylinder. The primary reference gage is a drop tape from reference point on shelf. The supplemental outside chain gage is located 10 feet upstream from gage. Cableway located 190 feet above gaging station is condemned.
Hydrologic Conditions.--	Basin is alpine and predominately subalpine terrain. Reservoir operations at Trujillo Meadows Reservoir and irrigation diversions affect flows at gage.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable except for Jan. 13 through Mar. 1, 2011 when the well and oil cylinder were frozen. The stage-discharge relation was affected by ice on Oct. 26-30, Nov. 10-30, Dec. 1-31, 2010, Jan. 1-12, Mar. 2-13, 23, 25, 2011. One unit value was missing on Nov. 1 and was filled using chart record. Two instrument corrections of +0.01 ft and -0.01 ft were made to the shaft encoder and prorated by time from previous visit. A -0.08 ft correction was applied to three unit values on Nov. 1 since encoder was not reset directly after adding oil to the cylinder. A +0.08 ft correction was made on May 17 due to oil cylinder overtopping. This correction was applied using comparison with chart record.
Datum Corrections.--	Levels were run to the Reference Point (RP) inside the gage on Sep. 27, 2011, using BM #5 as base. The RP was within allowable limits, so no correction was made or required. Two-peg tests were performed on the Lietz level (SN 130869) on May 27, Jul. 28, with no adjustment made, and Sep. 26, 2011, when an adjustment was made.
Rating.--	Control is a gravel and cobble riffle approximately 300 feet below the gage. Rating No. 15 was used from Oct 1, 2010 to Mar. 1, 2011 and Rating No. 16 was used from Mar. 1, 2011 through the rest of the water year. They are fairly well defined from 14 to 1210 cfs. Twenty-nine measurements (Nos. 638-666) were made this year ranging in discharge from 14.2 to 540 cfs. They cover the discharge range experienced except for the lower daily flows on Nov. 2, 10, 23, 24, Dec. 28-31, 2010, Jan. 1, 2, Feb. 2, 3, Aug. 10-12, 16-20, 2011; and higher daily flows on May 16, 17, 28-30, Jun. 2, 5-7, 2011. The peak flow of 848 cfs occurred at 0130 on May 29, 2011 at a gage height of 5.12 feet with a shift of -0.01 feet. It exceeded high measurement No. 655 made at a gage height of 4.40 feet on May 17, 2011 by 0.72 feet in stage.
Discharge.--	Shifting control method was used during all periods of good record. The stage-discharge relation was affected by ice and estimated Oct. 26-30, Nov. 10-30, Dec. 1-31, 2010, Jan. 1-12, Mar. 2-13, 23, 25, 2011. Shifts were applied as defined by measurements and were distributed by time. Open water measurements from Oct. 1, 2010 to Feb. 28, 2011 for rating No. 15 show shifts ranged from -0.03 to 0 ft; and from Mar. 1 to Sep 30, 2011 for rating No. 16 show shifts ranged from -0.04 to +0.04 ft. All measurements were given full weight and applied except Nos. 649, 652, 654, 655, 657, 665, and 666, which were adjusted as much as 4% to smooth shift distribution. High measurement No. 655 was adjusted 2% to better fit new rating and surrounding measurements.
Special Computations.--	Discharge for periods of winter no gage-height and ice affected record was estimated using measurements, weather records, partial day records, and comparison with the nearby station San Antonio River at Ortiz, CO.
Remarks.--	Record is good except for periods of no gage-height and ice affected record, which are poor. Station maintained and record developed by Div. 3 hydrographic staff.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08248000 LOS PINOS RIVER NEAR ORTIZ

RATING TABLE-- LOSORTCO15 USED FROM 01-OCT-2010 TO 01-MAR-2011
LOSORTCO16 USED FROM 01-MAR-2011 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	15	e19	e10	e15	e25	36	129	516	95	25	24
2	18	13	e18	e13	e13	e25	47	120	551	84	29	23
3	15	16	e18	e15	e12	e25	67	111	513	77	41	20
4	14	15	e18	e16	e14	e26	60	114	525	73	31	20
5	14	15	e17	e17	e15	e24	52	136	554	63	27	22
6	15	15	e17	e18	e16	e23	70	190	579	58	20	22
7	15	15	e17	e19	e15	e25	81	291	580	50	16	21
8	15	14	e17	e18	e15	e23	64	426	523	47	14	20
9	17	15	e17	e16	e14	e22	68	467	480	42	14	50
10	15	e13	e16	e15	e15	e22	55	378	441	38	13	46
11	15	e15	e18	e15	e16	e23	47	410	422	39	13	37
12	15	e17	e19	e14	e16	e23	55	298	405	43	13	28
13	15	e18	e18	e15	e17	e22	56	308	374	40	14	25
14	14	e20	e19	e16	e17	22	68	403	362	34	14	25
15	14	e18	e19	e17	e18	23	73	473	343	31	14	36
16	14	e20	e19	e17	e17	25	103	620	335	29	11	45
17	14	e20	e17	e18	e17	27	134	612	320	28	10	80
18	14	e18	e16	e18	e18	29	194	520	297	29	10	70
19	15	e18	e17	e16	e19	29	256	412	267	37	10	51
20	15	e20	e18	e15	e17	30	215	332	252	30	11	40
21	15	e18	e16	e15	e18	31	257	309	217	33	24	35
22	18	e15	e15	e15	e20	33	294	316	194	28	48	32
23	17	e10	e15	e14	e20	e25	307	355	181	24	66	31
24	20	e10	e14	e14	e19	26	235	387	171	26	40	28
25	19	e14	e14	e15	e19	e25	188	340	162	29	32	26
26	e18	e16	e14	e17	e21	24	175	414	145	28	29	24
27	e17	e18	e14	e17	e23	24	144	521	130	27	74	23
28	e15	e19	e13	e17	e24	22	132	630	118	30	45	23
29	e16	e20	e12	e16	---	22	130	736	109	32	46	21
30	e16	e20	e12	e16	---	23	128	685	101	25	33	21
31	16	---	e10	e15	---	26	---	521	---	28	27	---
TOTAL	488	490	503	489	480	774	3791	11964	10167	1277	814	969
MEAN	15.7	16.3	16.2	15.8	17.1	25.0	126	386	339	41.2	26.3	32.3
AC-FT	968	972	998	970	952	1540	7520	23730	20170	2530	1610	1920
MAX	20	20	19	19	24	33	307	736	580	95	74	80
MIN	14	10	10	10	12	22	36	111	101	24	10	20

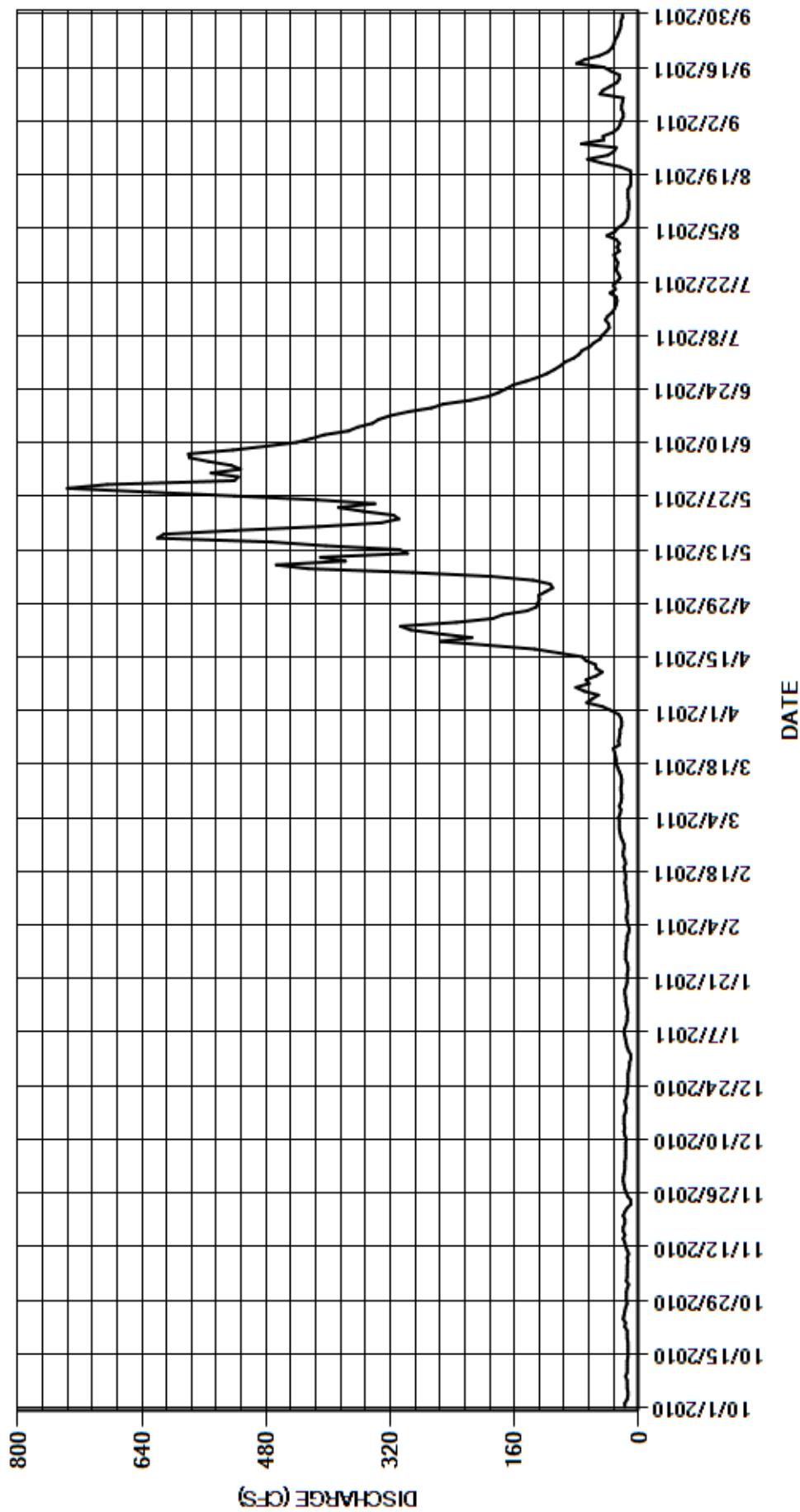
CAL YR	2010	TOTAL	39267	MEAN	108	MAX	914	MIN	6.7	AC-FT	77890
WTR YR	2011	TOTAL	32206	MEAN	88.2	MAX	736	MIN	10	AC-FT	63880

MAX DISCH: 848 CFS AT 01:30 ON MAY 29,2011 GH 5.12 FT SHIFT -0.01 FT

MAX GH: 5.12 FT AT 01:30 ON MAY 29,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08248000 LOS PINOS RIVER NEAR ORTIZ
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08248500 SAN ANTONIO RIVER NEAR MANASSA
Water Year 2011

Location.--	Lat 37°10'38", long 105°52'40" referenced to North American Datum of 1983 (Manassa, CO quad, scale 1:24,000), UTM Zone 13 422076 E and 4114886 N, in SE ¼ NE ¼ sec. 21, T.34 N., R.10 E., New Mexico Principal Meridian, Conejos County, CO, Hydrologic Unit 13010005, on right bank 0.3 mi downstream from bridge on State Highway 142, 2.2 mi upstream from mouth, and 3.3 mi east of Manassa, CO.
Drainage Area and Period of Record.--	348 mi ² . April 1923 to current year.
Equipment.--	Graphic water-stage recorder, data collection platform (Sutron Satlink), a float-operated shaft encoder, and a tipping bucket rain gage in metal pipe shelter and concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No change this water year.
Hydrologic Conditions.--	Flows at gage partially regulated by upstream irrigation diversions and return flows. Stream regularly is braided and dries up most years near gage.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Jan. 5 - Mar. 3, 2011 when the station was closed for the winter, and Dec. 31, 2010 - Jan. 4, 2011, Mar. 5 - 16, 2011 when ice in well was affecting floats. The stage-discharge relation was affected by ice Dec. 2-20, 25-30, 2010 and affected by backwater from beaver dam and debris Apr. 17-19, Aug. 3-10 and Aug. 12-17, 2011. There were three shaft encoder corrections; +0.01 ft on June 17, +0.01 ft on June 29, and -0.01 ft on Jul. 21, 2011. All corrections were prorated by time from previous visit.
Datum Corrections.--	Levels were not run this year. Levels were last run to the Reference Point (RP) inside the gage Aug. 12, 2009 using BM No. 4 as base. The RP elevation was within allowable limits, so no correction was made.
Rating.--	The low flow control is a gravel riffle approximately 150 ft. below gage, this feature is the control up to a stage of approximately 2.0 ft where the control transitions to channel control up to a stage of approximately 3.00 ft. From 3.00 ft to 5.02 ft the control is channel control (rating slope less than 2.0 ft.) and above 5.02 ft. is transitioning to overbank flow. Rating No. 20B, in use since Oct. 1, 2009 was used again this year. Eighteen measurements (Nos. 308-325) were made this year, ranging in discharge from 0 to 447 cfs. They cover the discharge range experienced except for the higher daily flow on May 17, 29, 30, 2011. The peak flow of 564 cfs occurred at 1315 on May 30, 2011 at a gage height of 4.72 feet with a shift of 0.00 feet. It exceeded high measurement No. 317 (GH=4.25), made on May 18, 2011 by 0.47 ft in stage.
Discharge.--	Shifting control method was used during all open water periods. The stage-discharge relation was affected by ice and estimated Dec. 2-20, 25-30, 2010 and affected by backwater from beaver dam and debris Apr. 17-19, Aug. 3-10 and Aug. 12-17, 2011. There were four trash cleaning corrections, which were applied as shifts and distributed through the apparent affected periods. Two shift curves were used during the higher water period from Apr. 19 to Jun. 29 and from Jun. 29 to Aug. 3, 2011. During other periods, shifts were applied as defined by discharge measurements and distributed by time. Measurement shifts ranged from -0.03 to +0.14 ft. All were given full weight except Nos. 313, 317, 321, and 324, which were adjusted as much as 3% to smooth shift distribution. There was no flow Oct. 1 through Nov. 30, 2010, Aug. 22, Sep. 4-9, 2011 (68 days).
Special Computations.--	Discharge for periods of no gage-height and ice affected record was estimated using measurements, weather records, partial day records, and comparison with nearby stations. Discharge for periods affected by backwater from beaver dam estimated using shift change at dam removal prorated back to estimated construction start. The highest measurement was adjusted -0.67% to a 0.00 ft shift due to entry of a missing 0.6 observation after record was worked.
Remarks.--	Record is good, except for periods of no gage-height and ice affected record, which are estimated and poor; and the period from Apr. 1 to 19, and Aug. 1 to 24, 2011 due to uncertainty in corrected mean measurement gage-heights and timing of beaver dam construction, which is fair. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	Draw new rating and export the beavers.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08248500 SAN ANTONIO RIVER NEAR MANASSA

RATING TABLE-- SANMANCO20B USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

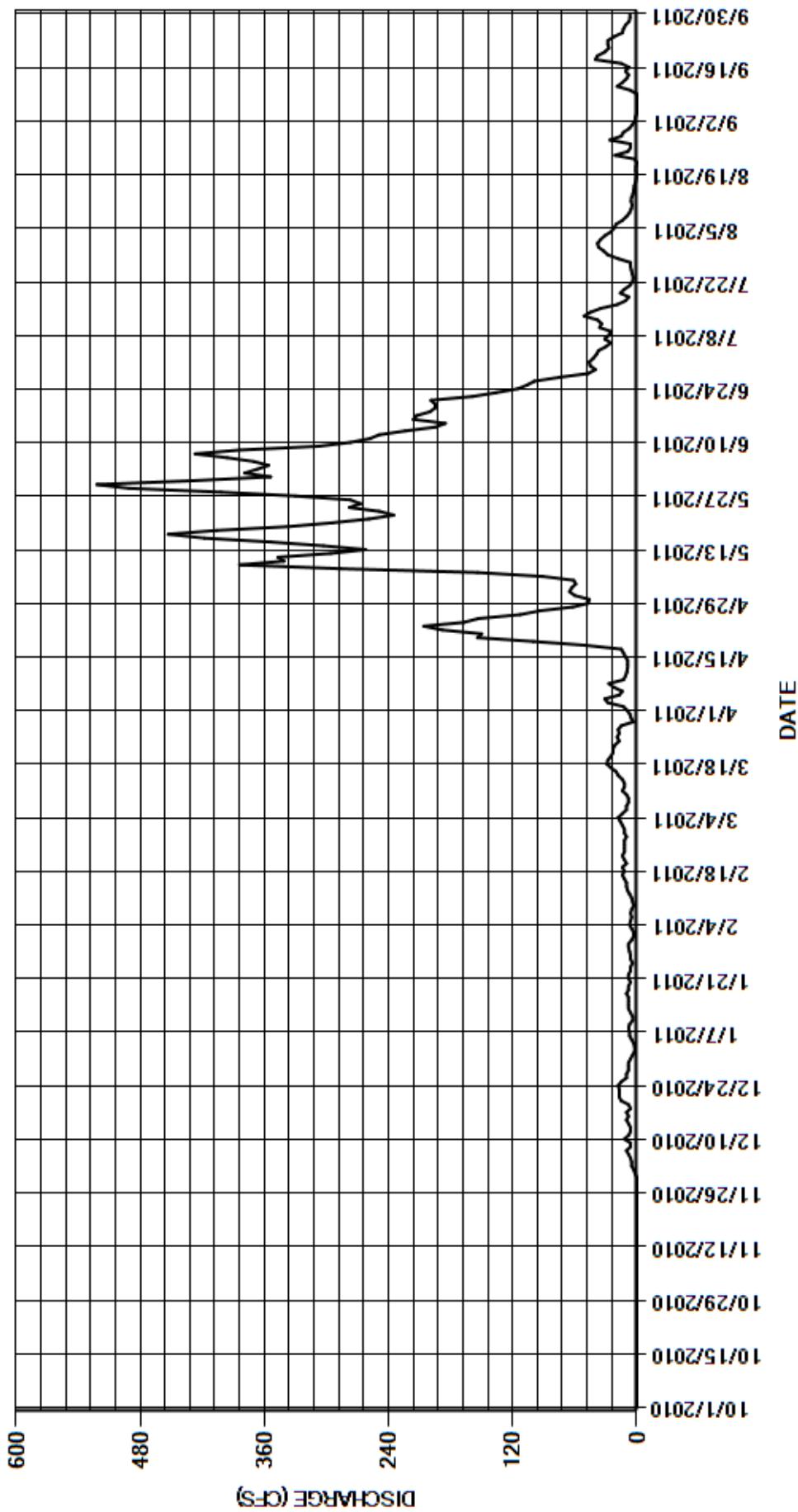
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	1.7	e4.0	e3.0	e12	9.4	60	354	46	38	4.3
2	0.00	0.00	e3.0	e2.0	e3.0	e14	13	65	379	42	35	1.9
3	0.00	0.00	e5.0	e2.0	e5.0	e16	28	63	367	39	e31	1.2
4	0.00	0.00	e5.0	e3.0	e7.0	18	31	59	356	37	e25	0.00
5	0.00	0.00	e6.0	e5.0	e6.0	e14	17	61	370	30	e22	0.00
6	0.00	0.00	e8.0	e7.0	e5.0	e10	14	91	396	25	e20	0.00
7	0.00	0.00	e10	e7.0	e6.0	e10	22	154	427	31	e14	0.00
8	0.00	0.00	e6.0	e8.0	e5.0	e8.0	27	286	384	27	e10	0.00
9	0.00	0.00	e6.0	e7.0	e3.0	e8.0	13	384	307	25	e7.0	0.00
10	0.00	0.00	e12	e4.0	e4.0	e10	11	341	277	36	e5.4	6.2
11	0.00	0.00	e8.0	e4.0	e5.0	e14	9.6	347	258	34	4.5	19
12	0.00	0.00	e6.0	e6.0	e7.0	e12	9.1	296	249	38	e5.5	14
13	0.00	0.00	e6.0	e8.0	e9.0	e12	9.0	262	224	51	e5.1	10
14	0.00	0.00	e8.0	e8.0	e10	e14	8.9	303	195	45	e3.5	8.0
15	0.00	0.00	e10	e8.0	e10	e18	11	354	185	35	e2.9	11
16	0.00	0.00	e8.0	e8.0	e12	e20	13	418	216	19	e2.4	7.4
17	0.00	0.00	e10	e10	e14	25	e15	453	213	11	e1.2	15
18	0.00	0.00	e6.0	e8.0	e12	29	e50	406	200	7.7	0.59	40
19	0.00	0.00	e8.0	e8.0	e14	28	e100	337	195	16	0.20	38
20	0.00	0.00	e15	e6.0	e10	25	154	294	195	12	0.91	31
21	0.00	0.00	17	e8.0	e12	23	150	259	199	6.7	0.71	27
22	0.00	0.00	17	e8.0	e14	23	188	235	159	4.1	0.00	28
23	0.00	0.00	17	e6.0	e12	21	206	249	136	3.4	1.7	28
24	0.00	0.00	18	e6.0	e12	17	167	278	115	4.3	21	22
25	0.00	0.00	e15	e4.0	e12	19	153	267	106	5.3	8.6	14
26	0.00	0.00	e10	e6.0	e12	17	113	277	99	6.2	6.0	13
27	0.00	0.00	e10	e6.0	e10	18	94	330	75	6.1	6.3	11
28	0.00	0.00	e8.0	e7.0	e12	15	62	402	47	18	26	7.4
29	0.00	0.00	e8.0	e8.0	---	3.4	47	491	40	28	15	6.6
30	0.00	0.00	e8.0	e8.0	---	5.5	46	522	45	32	13	6.4
31	0.00	---	e6.0	e5.0	---	6.7	---	429	---	37	7.3	---
TOTAL	0.00	0.00	281.7	195.0	246.0	485.6	1791.0	8773	6768	757.8	339.81	370.40
MEAN	0.000	0.000	9.09	6.29	8.79	15.7	59.7	283	226	24.4	11.0	12.3
AC-FT	0	0	559	387	488	963	3550	17400	13420	1500	674	735
MAX	0.00	0.00	18	10	14	29	206	522	427	51	38	40
MIN	0.00	0.00	1.7	2.0	3.0	3.4	8.9	59	40	3.4	0.00	0.00
CAL YR	2010	TOTAL	28837.26	MEAN	79.0	MAX	773	MIN	0.00	AC-FT	57200	
WTR YR	2011	TOTAL	20008.31	MEAN	54.8	MAX	522	MIN	0.00	AC-FT	39690	

MAX DISCH: 564 CFS AT 13:15 ON MAY 30,2011 GH 4.72 FT SHIFT 0 FT

MAX GH: 4.72 FT AT 13:15 ON MAY 30,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08248500 SAN ANTONIO RIVER NEAR MANASSA
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
NORTH CHANNEL CONEJOS RIVER NEAR LA SAUSES
Water Year 2011

Location.--	Lat 37°18'1", long 105°44'47" referenced to North American Datum of 1983 (Lasauses, CO quad, scale 1:24,000), UTM Zone 13 433851 E and 4128445 N, in SE ¼ SE ¼ sec. 2, T.35 N., R.11 E., New Mexico Principal Meridian, Conejos County, CO, Hydrologic Unit 13010005, on left bank of main channel 125 ft downstream from bridge on State Route 158, 1.0 mi upstream from mouth, 2.1 mi north of LaSauses, CO, and 13 mi southeast of Alamosa, CO.
Drainage Area and Period of Record.--	887 mi ² . March 1921 to current year. Monthly discharge only for some periods.
Equipment.--	Graphic water stage recorder, data collection platform (Sutron Satlink Logger 2) and a float-operated SDR and air temperature sensor in a four foot square timber shelter and well. The primary reference gage is a drop tape from reference point on shelf. The cableway is located 100 feet below gaging station. The supplementary outside chain gage is no longer operational.
Hydrologic Conditions.--	Natural flow of stream affected by diversions for irrigation, groundwater withdrawals, and return flows from irrigated areas. Flows regulated to some extent by Platoto Reservoir about 80 mi upstream since Nov. 7 1951
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log, SDR log, and chart record as backup. Record is complete and reliable. The stage-discharge relation was affected by ice Nov. 22-30, Dec. 1, 30, 31, 2010, Jan. 1-13, 20-25, 31, Feb. 1-12, 2011. There were two small flush corrections found on Mar. 1 and May 10, 2011. They were distributed by time using gage-height trend. No instrument corrections were needed.
Datum Corrections.--	Levels were not run this year. Levels were last run to the Reference Point (RP) inside the gage on Jul. 28, 2009 using B.M. No. 3 as base. The RP was within allowable limits, so a correction was not made.
Rating.--	Control is a gravel bar approximately 150 ft. below the gage at medium and low flows, and the channel at high flows. At low flows the water splits into two channels at the control section. The bank, willows, and high water in the Rio Grande influence gage height during very high flows. Rating No. 16, in use since Jan. 1, 2010, was used all year. Considering the variability of control section, the rating is fairly well defined from 0 to 1730 cfs. Twenty-seven measurements (Nos. 270-296) were made this year ranging in discharge from 0 to 446 cfs. The measurements cover the range experienced except for higher daily flows on Jun. 8, 2011. The peak flow of 530 cfs occurred at 0400 on June 8, 2011 at a gage height of 4.26 feet with a shift of -0.04 feet. It exceeded high measurement No. 289 (GH = 4.03), made June 8, 2011, by 0.23 feet in stage.
Discharge.--	Shifting control method was used during all periods of good record. The stage-discharge relation was affected by ice and discharge estimated Nov. 22-30, Dec. 1, 30, 31, 2010, Jan. 1-13, 20-25, 31, Feb. 1-12, 2011. Shifts were applied as defined by discharge measurements and distributed by time with respect to events. Measurements show shifts ranged from -0.06 ft to +0.06 ft. All measurements were given full weight and applied except Nos. 275, 276, 282, 285-288, 290, 291, and 293, which were adjusted as much as 4% to smooth shift distribution.
Special Computations.--	Discharge during periods of ice affected record was estimated using measurements, weather records, partial record days, and comparison with the South Channel Conejos River near LaSauses gage. The calculated discharge values on Oct. 31, Nov. 4, 9, 2010 were adjusted by +/- 0.1 cfs in order for the 2011 Water Year values to match the final 2010 Calendar Year values. The small discrepancies are due to mathematical differences between the old system using hourly average values and the new system using 15 minute unit values for daily mean discharge calculation.
Remarks.--	Record is good except for periods of ice affected record, which are poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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NORTH CHANNEL CONEJOS RIVER NEAR LA SAUSES

RATING TABLE-- NORLASCO16 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

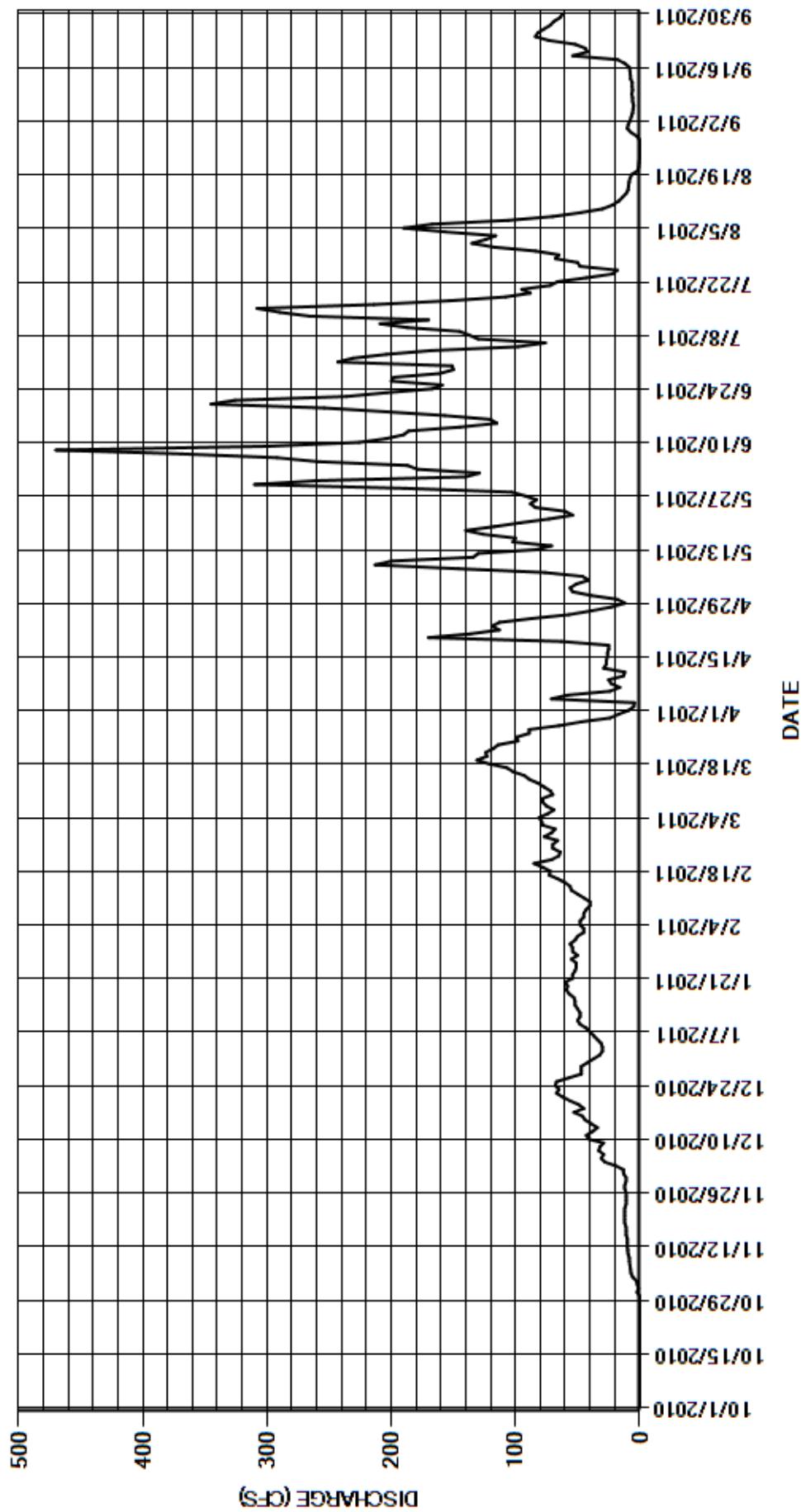
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	1.0	e13	e32	e50	68	9.0	39	140	243	135	9.3
2	0.00	1.9	13	e30	e45	78	4.7	54	129	231	124	7.8
3	0.00	2.8	19	e30	e45	79	4.2	56	179	204	116	6.9
4	0.00	5.7	28	e31	e48	81	71	51	187	168	157	5.8
5	0.00	7.1	31	e34	e48	74	58	41	260	98	190	5.4
6	0.00	7.4	29	e37	e45	69	24	46	292	76	167	4.9
7	0.00	7.9	33	e40	e45	75	16	76	369	130	106	5.7
8	0.00	8.3	32	e43	e43	78	23	146	470	137	70	5.7
9	0.00	8.4	29	e48	e40	78	25	213	299	145	48	6.4
10	0.00	9.4	41	e50	e40	70	13	200	226	187	30	5.8
11	0.00	9.6	43	e48	e45	72	12	134	204	209	22	6.1
12	0.00	10	38	e48	e50	77	29	130	190	170	17	6.0
13	0.00	10	34	e50	55	82	27	83	186	266	14	7.4
14	0.00	10	39	52	56	89	27	71	145	290	11	7.5
15	0.00	11	44	52	60	93	26	102	115	308	9.3	7.9
16	0.00	11	46	53	66	102	26	100	120	214	9.1	8.4
17	0.00	11	53	57	73	107	25	126	157	153	8.5	12
18	0.00	12	45	59	72	121	25	140	204	108	7.9	18
19	0.00	12	49	58	78	131	63	117	254	88	6.4	54
20	0.00	12	56	e60	85	123	170	96	345	95	1.5	42
21	0.00	12	62	e54	71	124	136	73	326	72	0.73	44
22	0.00	e12	67	e54	65	118	113	54	236	66	0.46	52
23	0.00	e11	65	e52	64	114	119	60	204	43	0.15	73
24	0.00	e11	68	e51	70	98	113	84	167	22	0.04	84
25	0.00	e11	67	e51	70	99	87	88	159	18	0.00	82
26	0.00	e11	57	55	66	89	57	83	200	48	0.00	77
27	0.00	e12	47	50	77	89	39	92	198	50	0.00	72
28	0.00	e12	47	54	71	65	23	103	161	68	0.00	69
29	0.00	e11	47	54	---	47	12	189	150	65	2.4	64
30	0.00	e11	e42	56	---	24	18	310	151	84	7.1	62
31	2.1	---	e37	e52	---	17	---	260	---	117	10	---
TOTAL	2.10	282.5	1321	1495	1643	2631	1394.9	3417	6423	4173	1270.58	912.0
MEAN	0.068	9.42	42.6	48.2	58.7	84.9	46.5	110	214	135	41.0	30.4
AC-FT	4.2	560	2620	2970	3260	5220	2770	6780	12740	8280	2520	1810
MAX	2.1	12	68	60	85	131	170	310	470	308	190	84
MIN	0.00	1.0	13	30	40	17	4.2	39	115	18	0.00	4.9
CAL YR	2010	TOTAL	42596.89	MEAN	117	MAX	1120	MIN	0.00	AC-FT	84490	
WTR YR	2011	TOTAL	24965.08	MEAN	68.4	MAX	470	MIN	0.00	AC-FT	49520	

MAX DISCH: 530 CFS AT 04:00 ON JUN 08,2011 GH 4.26 FT SHIFT -0.04 FT

MAX GH: 4.26 FT AT 04:00 ON JUN 08,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

NORTH CHANNEL CONEJOS RIVER NEAR LASAUSES
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
SOUTH CHANNEL CONEJOS RIVER NEAR LA SAUSES
Water Year 2011

Location.--	Lat 37°17'37", long 105°45'6" referenced to North American Datum of 1983 (Pikes Stockade, CO quad, scale 1:24,000), UTM Zone 13 433367 E and 4127712 N, in SE ¼ NE ¼ sec. 10, T.35 N., R.11 E., New Mexico Principal Meridian, Conejos County, CO, Hydrologic Unit 13010002, on left bank of secondary channel 0.3 mi upstream from bridge on State Route 158, 1.5 mi north of LaSauses, CO, and 13 mi southeast of Alamosa, CO.
Drainage Area and Period of Record.--	887 mi ² . March 29, 1921 to current year, at various sites close to present location.
Equipment.--	Graphic water stage recorder, data collection platform (Sutron Satlink 2) and a float-operated shaft encoder in a 42-inch metal pipe shelter and concrete well. The primary reference gage is a drop tape from reference point on shelf. No outside gage. No change this water year.
Hydrologic Conditions.--	Natural flow of stream affected by diversions for irrigation, groundwater withdrawals, and return flows from irrigated areas. Flows regulated to some extent by Platoro Reservoir about 80 mi upstream since Nov. 7, 1951.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable, except for Jan 11 - Mar. 13, 2011 when floats were affected by ice in well or the inlets were frozen. The stage-discharge relation was affected by ice Nov. 30 - Dec. 1, 31, 2010, Jan. 1-10, 2011 and by backwater on Jul. 15, 2011. One missing unit value was filled from chart record on Sep. 27. Two 0.13 ft instrument calibration corrections were made, the first November 15, 2010 and the second October 3, 2011 both corrections resulted from oil leaking from the oil cylinder and both were prorated back to the previous period with no flow without loss of accuracy.
Datum Corrections.--	Levels were not shot this year. Levels were last shot to the Reference Point (RP) inside the gage on Jul. 13, 2010 using BM No. 9 as base. The gage was within allowable limits and no correction was made to the RP.
Rating.--	The control is a steel sheet piling weir with a low flow notch. Rating No. 9 in use from Mar. 21, 2008 was used again this year. It is well defined from 0 to 379 cfs. Twenty-six measurements (Nos. 404-429) were made this year ranging in discharge from 0 to 25.9 cfs. They cover the daily discharge range experienced this year. The peak flow of 24.8 cfs occurred at 0600 on June 8, 2011 at a gage height of 2.18 feet with a shift of 0.03 feet. It did not exceed the stage high measurement No. 452 (GH = 2.20), made July 15, 2015, which was affected by backwater.
Discharge.--	Shifting control method was used during all periods of good record. There was no flow Oct. 1-Nov. 6, 2011, Aug. 17 - Sept. 18, 2011 (70 days). The stage-discharge relation was affected by ice and discharge estimated Nov. 30 - Dec. 1, 31, 2010, Jan. 1-10, 2011. Only minor shifting due to vegetative growth above the sheet-metal weir and most shifts result from measurement error and some minor affect from holes in weir. A variable shift curve was used to redefine the rating from Mar. 1 through Sep. 30, except for Jul. 15, due to some backwater effect. During other periods, shifts were applied as defined by measurements and distributed by time. Measurement shifts ranged from -0.06 ft (backwater affected) to +0.05 ft. All measurements were given full weight except Nos. 441, 444, 447, 450, 451, and 453 which were adjusted as much as 5% percent to smooth shift distribution.
Special Computations.--	Discharge for periods of no gage-height, ice affected, and backwater affected record was estimated using measurements, weather records, partial record days, and comparison with the North Channel of the Conejos River near LaSauses. The calculated discharge values on Nov. 17, Dec. 22, 2010 were adjusted by +/- 0.1 cfs and Dec. 24, 2010 was adjusted by 0.01 cfs in order for the 2011 Water Year values to match the final 2010 Calendar Year values. The small discrepancies are due to mathematical differences between the old system using hourly average values and the new system using 15 minute unit values for daily mean discharge calculation.
Remarks.--	Record is good except for periods of estimation, which are poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	Pave measuring section to reduce error caused by vegetation growth in channel and run levels to new benchmark.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SOUTH CHANNEL CONEJOS RIVER NEAR LA SAUSES

RATING TABLE-- SOULASCO09 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

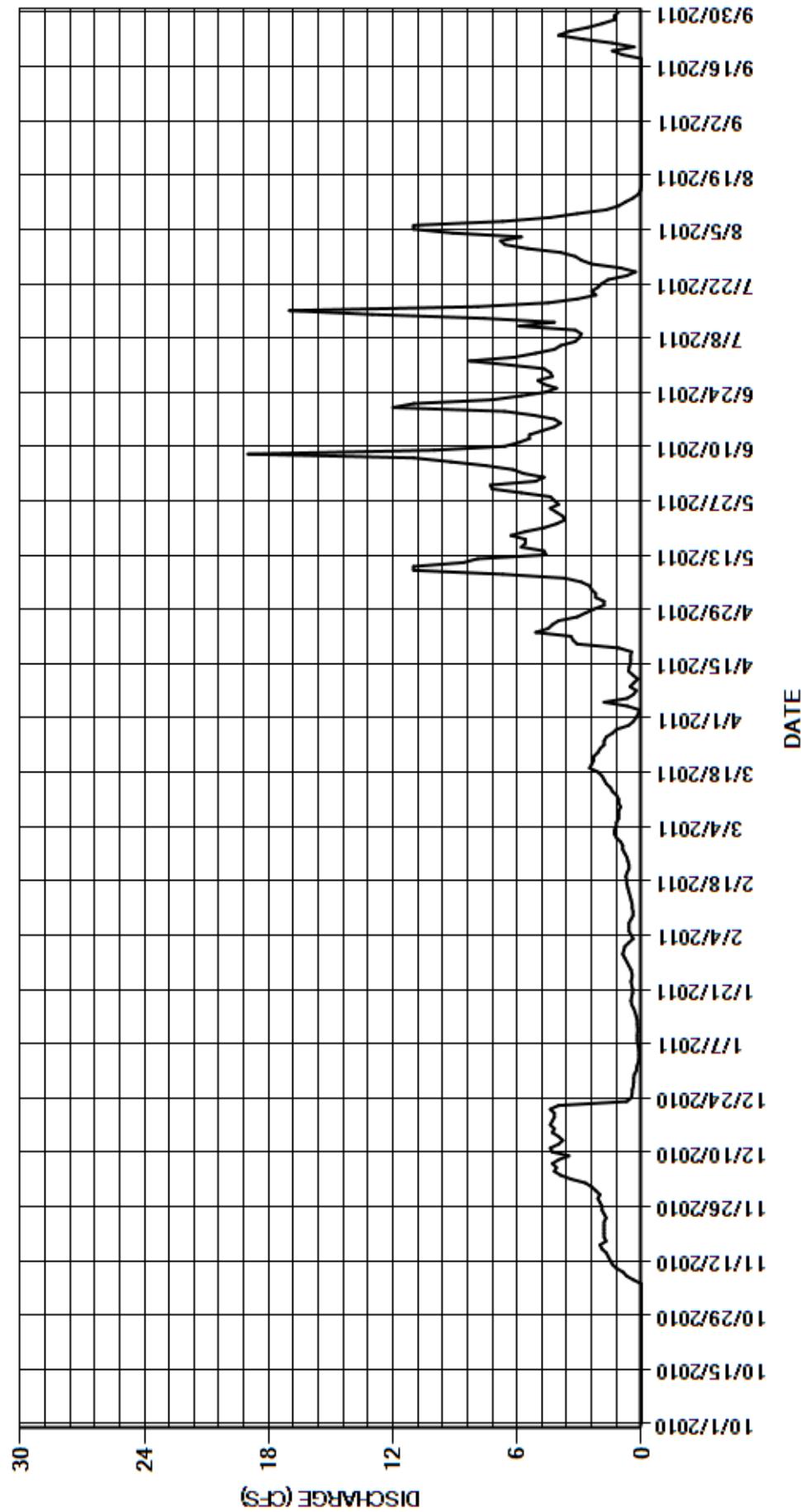
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	e2.4	e0.22	e0.80	e1.2	0.26	1.8	5.1	6.4	6.6	0.00
2	0.00	0.00	2.7	e0.16	e0.60	e1.3	0.15	2.2	4.7	8.3	6.8	0.00
3	0.00	0.00	3.4	e0.12	e0.40	e1.3	0.09	2.2	5.7	6.1	5.8	0.00
4	0.00	0.00	3.9	e0.12	e0.50	e1.2	0.68	2.4	6.2	5.1	9.1	0.00
5	0.00	0.00	4.2	e0.12	e0.60	e1.2	1.8	2.5	7.5	4.2	11	0.00
6	0.00	0.00	4.1	e0.14	e0.60	e1.1	0.68	2.9	9.2	3.9	11	0.00
7	0.00	0.38	4.3	e0.18	e0.60	e1.1	0.38	3.7	11	3.2	6.7	0.00
8	0.00	0.71	4.0	e0.20	e0.50	e1.1	0.24	6.7	19	3.0	4.4	0.00
9	0.00	0.88	3.5	e0.20	e0.40	e1.0	0.55	11	10	2.9	3.1	0.00
10	0.00	1.2	4.3	e0.18	e0.40	e1.1	0.36	11	6.6	3.2	1.7	0.00
11	0.00	1.4	4.4	e0.18	e0.45	e1.1	0.17	8.6	5.9	5.9	1.1	0.00
12	0.00	1.5	4.0	e0.20	e0.45	e1.2	0.41	7.9	5.4	4.2	0.77	0.00
13	0.00	1.6	3.8	e0.20	e0.50	e1.4	0.62	4.6	5.4	7.6	0.41	0.00
14	0.00	1.7	4.0	e0.25	e0.55	1.5	0.59	4.7	4.8	13	0.15	0.00
15	0.00	1.9	4.3	e0.30	e0.60	1.7	0.53	5.8	4.2	e17	0.04	0.00
16	0.00	2.0	4.2	e0.37	e0.65	1.8	0.51	5.6	3.9	7.9	0.01	0.00
17	0.00	1.7	4.4	e0.47	e0.70	1.9	0.52	5.6	4.2	4.5	0.00	0.00
18	0.00	1.8	4.3	e0.50	e0.70	2.1	0.47	6.3	5.2	3.1	0.00	0.00
19	0.00	1.8	4.2	e0.47	e0.75	2.5	1.1	5.6	6.6	2.2	0.00	0.92
20	0.00	1.8	4.2	e0.42	e0.70	2.4	3.1	4.7	12	2.4	0.00	1.4
21	0.00	1.8	4.4	e0.42	e0.60	2.3	3.3	4.1	11	2.1	0.00	0.35
22	0.00	1.8	4.0	e0.47	e0.60	2.3	3.4	3.7	7.2	1.9	0.00	1.4
23	0.00	1.7	0.71	e0.50	e0.65	2.1	5.1	3.8	5.8	1.6	0.00	2.8
24	0.00	1.8	0.48	e0.45	e0.70	2.0	4.5	4.1	4.6	0.70	0.00	4.0
25	0.00	1.9	0.45	e0.45	e0.80	1.8	4.3	4.4	4.1	0.28	0.00	3.5
26	0.00	1.9	0.44	e0.50	e0.90	1.8	4.0	4.0	4.7	1.0	0.00	2.6
27	0.00	2.0	0.39	e0.60	e0.90	1.7	3.1	4.2	5.0	2.4	0.00	1.9
28	0.00	2.1	0.37	e0.70	e1.0	1.4	2.7	4.4	4.3	2.9	0.00	1.3
29	0.00	2.0	0.37	e0.80	---	1.2	2.3	5.8	4.4	3.2	0.00	1.3
30	0.00	e2.2	0.34	e0.90	---	0.62	1.8	7.2	4.7	3.9	0.00	1.1
31	0.00	---	e0.24	e0.85	---	0.39	---	7.3	---	5.5	0.00	---
TOTAL	0.00	39.57	90.79	11.64	17.60	46.81	47.71	158.8	198.4	139.58	68.68	22.57
MEAN	0.000	1.32	2.93	0.38	0.63	1.51	1.59	5.12	6.61	4.50	2.22	0.75
AC-FT	0	78	180	23	35	93	95	315	394	277	136	45
MAX	0.00	2.2	4.4	0.90	1.0	2.5	5.1	11	19	17	11	4.0
MIN	0.00	0.00	0.24	0.12	0.40	0.39	0.09	1.8	3.9	0.28	0.00	0.00
CAL YR	2010	TOTAL	1270.84	MEAN	3.48	MAX	107	MIN	0.00	AC-FT	2520	
WTR YR	2011	TOTAL	842.15	MEAN	2.31	MAX	19	MIN	0.00	AC-FT	1670	

MAX DISCH: 24.8 CFS AT 06:00 ON JUN 08,2011 GH 2.18 FT SHIFT 0.03 FT
MAX GH: 2.21 FT AT 12:45 ON JUL 15,2011 (BACKWATER FROM VEGETATIVE GROWTH)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH CHANNEL CONEJOS RIVER NEAR LASAUSES
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08249000 COMBINED CONEJOS RIVER (NORLASCO SOULASCO)
Water Year 2011

Location.--	Lat 37°18'01", long 105°44'47", in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 2, and SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 10 (two channels), T.35 N., R.II E., Conejos County, Hydrologic Unit 13010005, on left bank of main channel 125 ft downstream from bridge on State Highway 158 and on left bank of secondary channel 0.3 mi upstream from bridge on State Route 158, 2.1 mi north of LaSause, and 13 mi southeast of Alamosa.
Drainage Area and Period of Record.--	887 mi ² . Mar. 1921 to present.
Equipment.--	See individual station analyses for gage equipment descriptions.
Hydrologic Conditions.--	Natural flow of stream affected by diversions for irrigation, groundwater withdrawals, and return flows from irrigated areas. Flows regulated to some extent by Platoto Reservoir about 80 mi upstream since Nov. 7 1951.
Gage-Height Record.--	See individual station analyses.
Datum Corrections.--	See individual station analyses.
Rating.--	See individual station analyses.
Discharge.--	Daily discharges computed by summing and rounding the individual station daily discharges. A day is considered estimated when both channels are estimated or the estimated daily value for either the North or South channel is greater than 10% of the combined daily sum of both channels. The following days were considered estimated: Nov. 22-30, Dec. 1, 30, 31, 2010, Jan. 1-13, 20-25, 31, Feb. 1-12, 2011.
Special Computations.--	
Remarks.--	Record is good except for periods of estimated record, which are poor. Record developed by Division 3 Hydrographic staff.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08249000 COMBINED CONEJOS RIVER (NORLASCO SOULASCO)

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

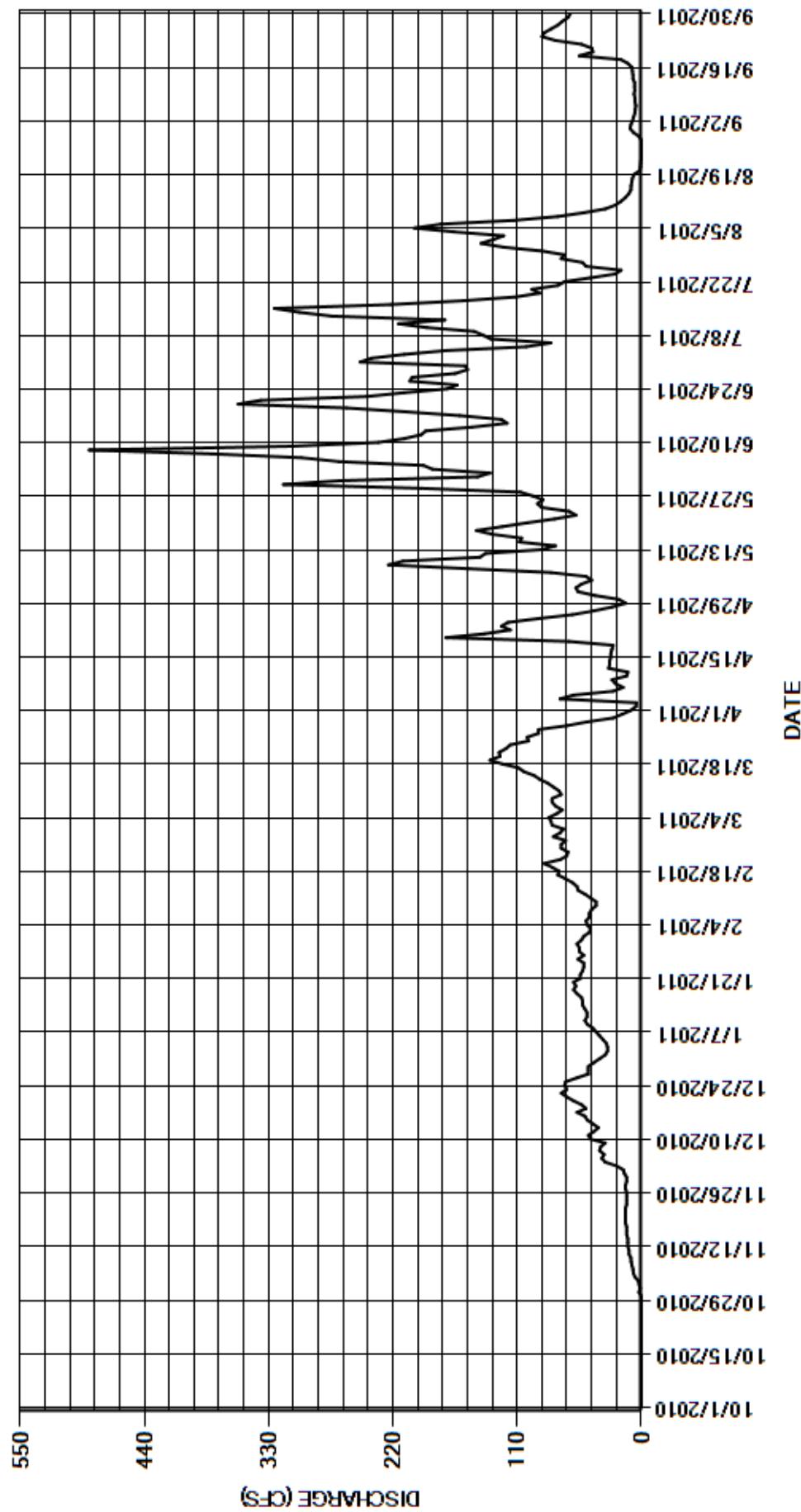
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	1.0	e15	e32	e51	69	9.3	41	145	249	142	9.3
2	0.00	1.9	16	e30	e46	79	4.8	56	134	239	131	7.8
3	0.00	2.8	22	e30	e45	80	4.3	58	185	210	122	6.9
4	0.00	5.7	32	e31	e48	82	72	53	193	173	166	5.8
5	0.00	7.1	35	e34	e49	75	60	44	268	102	201	5.4
6	0.00	7.4	33	e37	e46	70	25	49	301	80	178	4.9
7	0.00	8.3	37	e40	e46	76	16	80	380	133	113	5.7
8	0.00	9.0	36	e43	e44	79	23	153	489	140	74	5.7
9	0.00	9.3	32	e48	e40	79	26	224	309	148	51	6.4
10	0.00	11	45	e50	e40	71	13	211	233	190	32	5.8
11	0.00	11	47	e48	e45	73	12	143	210	215	23	6.1
12	0.00	12	42	e48	e50	78	29	138	195	174	18	6.0
13	0.00	12	38	e50	56	83	28	88	191	274	14	7.4
14	0.00	12	43	52	57	90	28	76	150	303	11	7.5
15	0.00	13	48	52	61	95	27	108	119	325	9.3	7.9
16	0.00	13	50	53	67	104	27	106	124	222	9.1	8.4
17	0.00	13	57	57	74	109	26	132	161	158	8.5	12
18	0.00	14	49	60	73	123	25	146	209	111	7.9	18
19	0.00	14	53	58	79	134	64	123	261	90	6.4	55
20	0.00	14	60	e60	86	125	173	101	357	97	1.5	43
21	0.00	14	66	e54	72	126	139	77	337	74	0.73	44
22	0.00	e14	71	e54	66	120	116	58	243	68	0.46	53
23	0.00	e13	66	e52	65	116	124	64	210	45	0.15	76
24	0.00	e13	68	e51	71	100	118	88	172	23	0.04	88
25	0.00	e13	67	e51	71	101	91	92	163	18	0.00	86
26	0.00	e13	57	56	67	91	61	87	205	49	0.00	80
27	0.00	e14	47	51	78	91	42	96	203	52	0.00	74
28	0.00	e14	47	55	72	66	26	107	165	71	0.00	70
29	0.00	e13	47	55	---	48	14	195	154	68	2.4	65
30	0.00	e13	e42	57	---	25	20	317	156	88	7.1	63
31	2.1	---	e37	e53	---	17	---	267	---	122	10	---
TOTAL	2.10	325.5	1405	1502	1665	2675	1443.4	3578	6622	4311	1339.58	934.0
MEAN	0.068	10.8	45.3	48.5	59.5	86.3	48.1	115	221	139	43.2	31.1
AC-FT	4.2	646	2790	2980	3300	5310	2860	7100	13130	8550	2660	1850
MAX	2.1	14	71	60	86	134	173	317	489	325	201	88
MIN	0.00	1.0	15	30	40	17	4.3	41	119	18	0.00	4.9
CAL YR	2010	TOTAL	43864.21	MEAN	120	MAX	1210	MIN	0.00	AC-FT	87000	
WTR YR	2011	TOTAL	25802.58	MEAN	70.7	MAX	489	MIN	0.00	AC-FT	51180	

MAX DISCH:

MAX GH: 0.00 FT

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08249000 COMBINED CONEJOS RIVER (NORLASCO SOULASCO)
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08250000 CULEBRA CREEK AT SAN LUIS
Water Year 2011

Location.--	Lat 37°11'2", long 105°25'33" referenced to North American Datum of 1983 (San Luis, CO quad, scale 1:24,000), UTM Zone 13 462202 E and 4115357 N, in NE ¼ NW ¼ sec. 35, T.3 N., R.72 W., Costilla Estates Development Survey so called, Costilla County, CO, Hydrologic Unit 13010002, on left bank at bridge 1.0 mi south of San Luis, CO and 1.0 mi upstream from Rito Seco.
Drainage Area and Period of Record.--	220 mi ² . April 1927 to current year.
Equipment.--	Graphic water-stage recorder, data collection platform (Sutron Model Satlink2 with HDR GOES radio), and a float-operated shaft encoder in a metal shelter and concrete/timber well. The primary reference gage is a drop tape from reference point on shelf. Outside staff gage. No change.
Hydrologic Conditions.--	The majority of Culebra Creek is diverted into Sanchez Reservoir via the Sanchez Canal. The reservoir is approximately 5.6 miles above the gage. Several other small drainages feed this reservoir. Two small tributaries plus the un-diverted portion of Culebra Creek join the outflow from Sanchez Reservoir above the gage. Most of the water at this gage is regulated by the reservoir and irrigation diversions.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log and chart record as backup. Record is complete and reliable for the water year. One erroneous 15-minute value that occurred on Apr. 21 during a measurement visit was corrected. There was one instrument correction of -0.01 feet made to the shaft encoder on Jun. 16, 2011. This correction was prorated by time from previous visit.
Datum Corrections.--	Levels were not run this year due to stability of elevations from bench marks. Levels were last run Jul. 16, 2008 to the Reference Point (RP) inside the gage using BM #3 as base. The RP elevation was within allowable limits, so no correction was made.
Rating.--	Control is a non-standard 12-ft. concrete Parshall flume. Gravel and moss in flume, and changes in approach conditions cause shifting. Rating No. 6 was used again this year. It is fairly well defined from 9 to 200 cfs. Seventeen measurements (Nos. 247-263) were made this year ranging in discharge from 11.3 to 98.8 cfs. Measurements cover the range experienced except for higher daily flows on Jun. 1-4, 6-8, 14-16, 29, 2011. The peak flow of 140 cfs occurred at 0700 on June 16, 2011 at a gage height of 1.68 feet with a shift of 0.06 feet. It exceeded high measurement No. 259 (GH=1.36 feet) made June 28, 2011 by 0.32 feet in stage.
Discharge.--	Shifting control method was used for all periods. Shifts were applied as defined by measurements and were distributed by time. Measured shifts varied from -0.04 to +0.11 feet. Measurement No. 257, an ADCP measurement, was not used due to an abnormally large range in transect discharges. All others were given full weight except Nos. 248, 251, 254, 258, 260, and 263, which were adjusted as much as 6% to smooth shift distribution.
Special Computations.--	During the winter the record may show a pattern of jagged peaks in the late morning hours. While this pattern does appear to be ice affected record, it has been verified by the hydrographic staff of Division 3 that this is caused by ice dams releasing water above the gage, and that this is good record.
Remarks.--	Record is good. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

08250000 CULEBRA CREEK AT SAN LUIS

RATING TABLE-- CULSANCO06 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

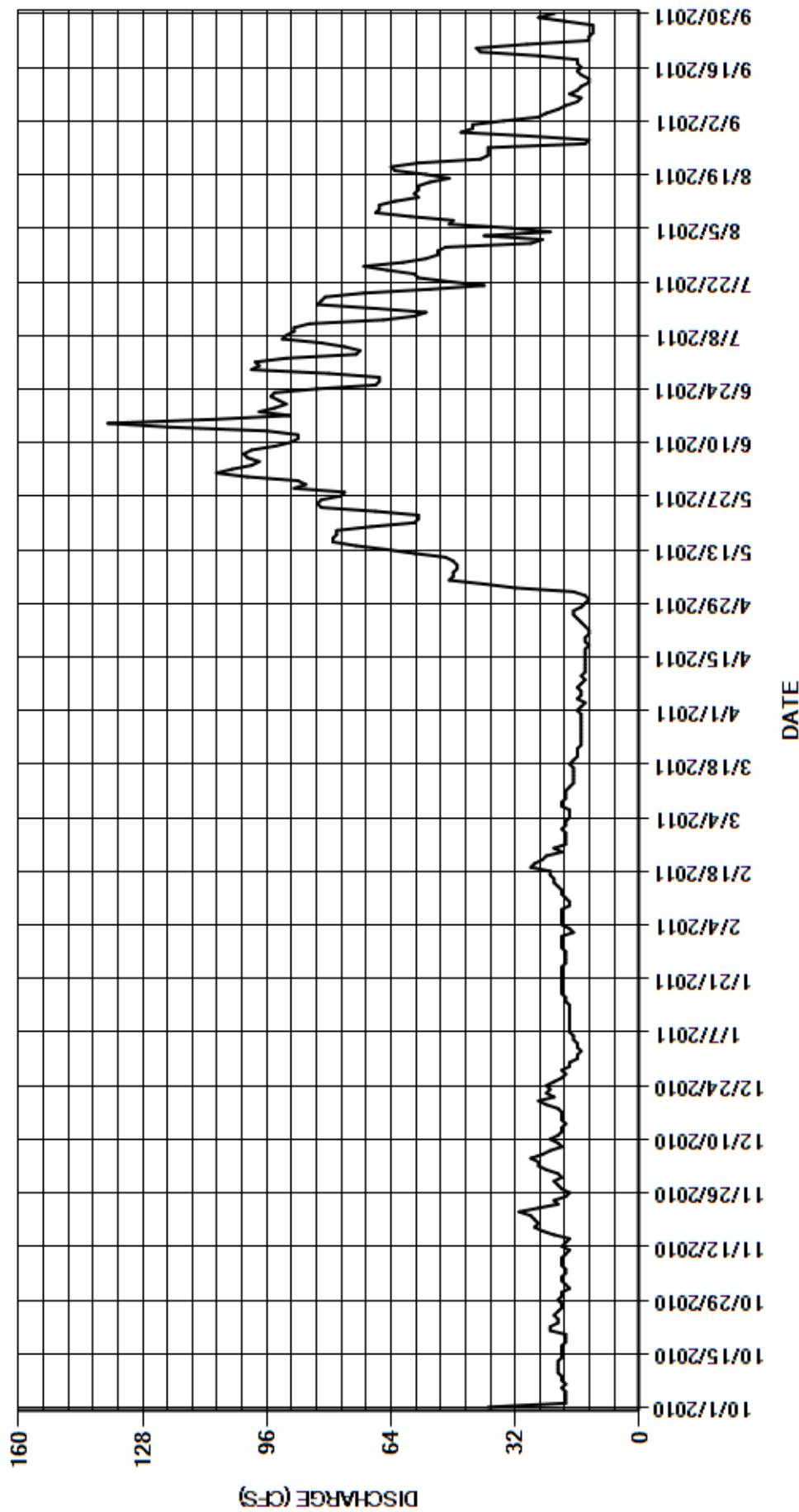
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	39	18	21	16	20	20	16	14	101	99	28	43
2	19	19	24	15	17	19	15	17	109	91	25	35
3	19	20	26	16	18	19	14	32	105	73	40	26
4	19	20	26	16	20	18	16	40	100	72	23	24
5	19	19	28	17	20	18	15	49	98	76	33	21
6	20	19	25	17	20	18	15	48	101	82	49	19
7	19	20	23	18	20	20	16	48	102	92	48	16
8	20	20	20	18	20	20	15	47	100	91	59	15
9	20	20	21	18	18	19	14	47	94	89	68	18
10	21	19	23	18	18	19	15	48	90	89	67	16
11	21	18	21	18	19	19	14	50	88	85	67	15
12	21	20	20	18	20	18	14	58	88	66	63	13
13	21	19	20	18	20	17	14	65	96	58	57	13
14	20	18	19	18	21	17	14	73	121	55	58	15
15	20	22	20	19	22	17	14	79	137	68	57	16
16	20	25	20	19	22	17	14	79	110	83	57	15
17	20	27	20	20	23	17	14	78	90	82	54	16
18	19	26	21	20	23	18	13	78	98	81	49	16
19	19	27	24	20	28	17	14	69	94	71	55	26
20	19	28	26	20	27	16	14	58	91	54	63	41
21	23	31	22	20	25	16	13	57	93	40	64	42
22	23	26	24	20	24	16	13	57	95	49	57	29
23	21	21	23	20	20	15	14	68	94	57	41	13
24	21	22	24	20	22	15	15	82	83	58	39	13
25	22	19	22	19	19	15	16	83	68	65	39	12
26	21	18	20	19	19	15	17	82	67	71	39	12
27	20	20	19	19	19	15	17	77	67	61	14	12
28	20	21	20	19	19	15	15	76	80	55	13	19
29	21	22	18	20	---	15	14	89	100	52	28	26
30	20	20	18	20	---	15	13	86	98	52	46	22
31	20	---	16	20	---	15	---	88	---	50	43	---
TOTAL	647	644	674	575	583	530	437	1922	2858	2167	1443	619
MEAN	20.9	21.5	21.7	18.5	20.8	17.1	14.6	62.0	95.3	69.9	46.5	20.6
AC-FT	1280	1280	1340	1140	1160	1050	867	3810	5670	4300	2860	1230
MAX	39	31	28	20	28	20	17	89	137	99	68	43
MIN	19	18	16	15	17	15	13	14	67	40	13	12
CAL YR	2010	TOTAL	16212	MEAN	44.4	MAX	124	MIN	16	AC-FT	32160	
WTR YR	2011	TOTAL	13099	MEAN	35.9	MAX	137	MIN	12	AC-FT	25980	

MAX DISCH: 140 CFS AT 07:00 ON JUN 16,2011 GH 1.68 FT SHIFT 0.06 FT

MAX GH: 1.68 FT AT 07:00 ON JUN 16,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08250000 CULEBRA CREEK AT SAN LUIS
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
08251500 RIO GRANDE RIVER NEAR LOBATOS
Water Year 2011

Location.--	Lat 37°4'43", long 105°45'25" referenced to North American Datum of 1983 (Kiowa Hill, CO quad, scale 1:24,000), UTM Zone 13 432719 E and 4103861 N, in SE ¼ SE ¼ sec. 27, T.33 N., R.11 E., New Mexico Principal Meridian, Conejos County, CO, Hydrologic Unit 13010002, on right bank at highway bridge, 5.7 mi north of Colorado-New Mexico State line, 8 mi downstream from Culebra Creek, 11 mi east of Lobatos, CO, and 14 mi east of Antonito, CO.
Drainage Area and Period of Record.--	7,700 mi ² . approximately, includes 2,940 mi ² . in Closed Basin in northern part of San Luis Valley, Colo. July 1899 to present.
Equipment.--	Graphic water-stage recorder, data collection platform (Sutron model Satlink 2), a float-operated Sutron SDR shaft-encoder, and a water temperature sensor in a four foot square timber shelter and cobblestone well. SDR float is operated in an oil cylinder during winter months. The primary reference gage is a drop tape from reference point on shelf. Un-readable auxiliary outside slope gage abandoned.
Hydrologic Conditions.--	Natural streamflow is affected by transmountain diversions, storage reservoirs, ground-water withdrawals, diversions for irrigation, and return flows from irrigated areas.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log, SDR log, and chart record as backup. Record is complete and reliable. The stage-discharge relation was affected by ice Nov. 22-30, Dec. 1-11, 30-31, 2010, Jan. 1 – Feb. 27, 2011. Two 15-minute stage values were filled from chart record on May 4, 2011 without loss of accuracy. A -0.01 ft instrument correction was made to the shaft encoder on Mar. 15, 2011 and prorated back to the previous visit. A +0.04 ft flush correction was made on Jun. 20, 2011 and prorated back to an inflection point the same day.
Datum Corrections.--	Levels were not run this year. Levels were last run to the Reference Point (RP) inside the gage on Jul. 1, 2010 using BM No. 2 as base. The gage was found to be reading within allowable limits, so a correction was not made.
Rating.--	The control is composed of boulders and cobbles. Shifting is caused by movement of sand, silt, and gravel in the streambed, and by seasonal heavy weed and moss growth. Rating No. 3, in use since May 1, 1965, was used again this year. This rating is probably not very well defined due to the constant growth and death cycles of weeds and moss as well as heavy silt deposition due to this growth. There is only a brief period of time after ice goes out and scour the channel and before heavy aquatic growth begins that the true stage-discharge relation is not influenced by other factors. Twenty-six measurements (171-196) were made this year ranging in discharge from 29.7 to 932 cfs. They cover the discharge range experienced except for lower daily flows on Oct. 6-9, 2010. The peak flow of 988 cfs occurred at 0615 on June 9, 2011 at a gage height of 2.71 ft with a shift of -0.09 ft. It exceeded high measurement No. 189 with a gage height of 2.65 ft, made Jun. 9, 2011 by 0.06 ft in stage.
Discharge.--	Shifting control method was used during all periods of good record. The stage-discharge relation was affected by ice and discharge estimated Nov. 22-30, Dec. 1-11, 30-31, 2010, Jan. 1 – Feb. 27, 2011. Variable shift curves RIOLOBVS11-1, RIOLOBVS11-2, and RIOLOBVS11-3 were used to define the stage-shift relation for the periods Feb 15 - May 2, 2011, Jun 9 - Sep 9, 2011. The last two shift curves were left open-ended at the top since there was no evidence to indicate shifts trending back toward the rating within the defined flows. During other open water periods, shifts were applied as defined by discharge measurements and distributed by time and events. Measurements show shifts varied from -0.09 to +0.14 feet. All measurements were given full weight and applied except Nos. 172, 174, 186, and 195 which were adjusted as much as 5% to smooth shift distribution.
Special Computations.--	Discharge for periods of ice-affected record was estimated using measurements, weather records, trends, and comparison with the stations Rio Grande near Cerro, New Mexico, and Rio Grande near Taos Junction Bridge, New Mexico minus the Red River near Questa, New Mexico. Rio Grande near Cerro, New Mexico was estimated from Dec. 31, 2010 to Jan 3, 2011 due to missing data at the time of records computation.
Remarks.--	The calculated discharge values on Oct. 1, 12, 24, Nov. 5, 8, 9, 13, 19, 20, Dec. 12, 17, 26, 28, 2010 were adjusted by +/- 1 cfs in order for the 2011 Water Year values to match the final 2010 Calendar Year values. The small discrepancies are due to mathematical differences between the old system using hourly average values and the new system using 15 minute unit values for daily mean discharge calculation.
Recommendations.--	Install secondary reference gage.

STATE OF COLORADO
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OFFICE OF STATE ENGINEER

08251500 RIO GRANDE RIVER NEAR LOBATOS

RATING TABLE-- RIOLOBCO03 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

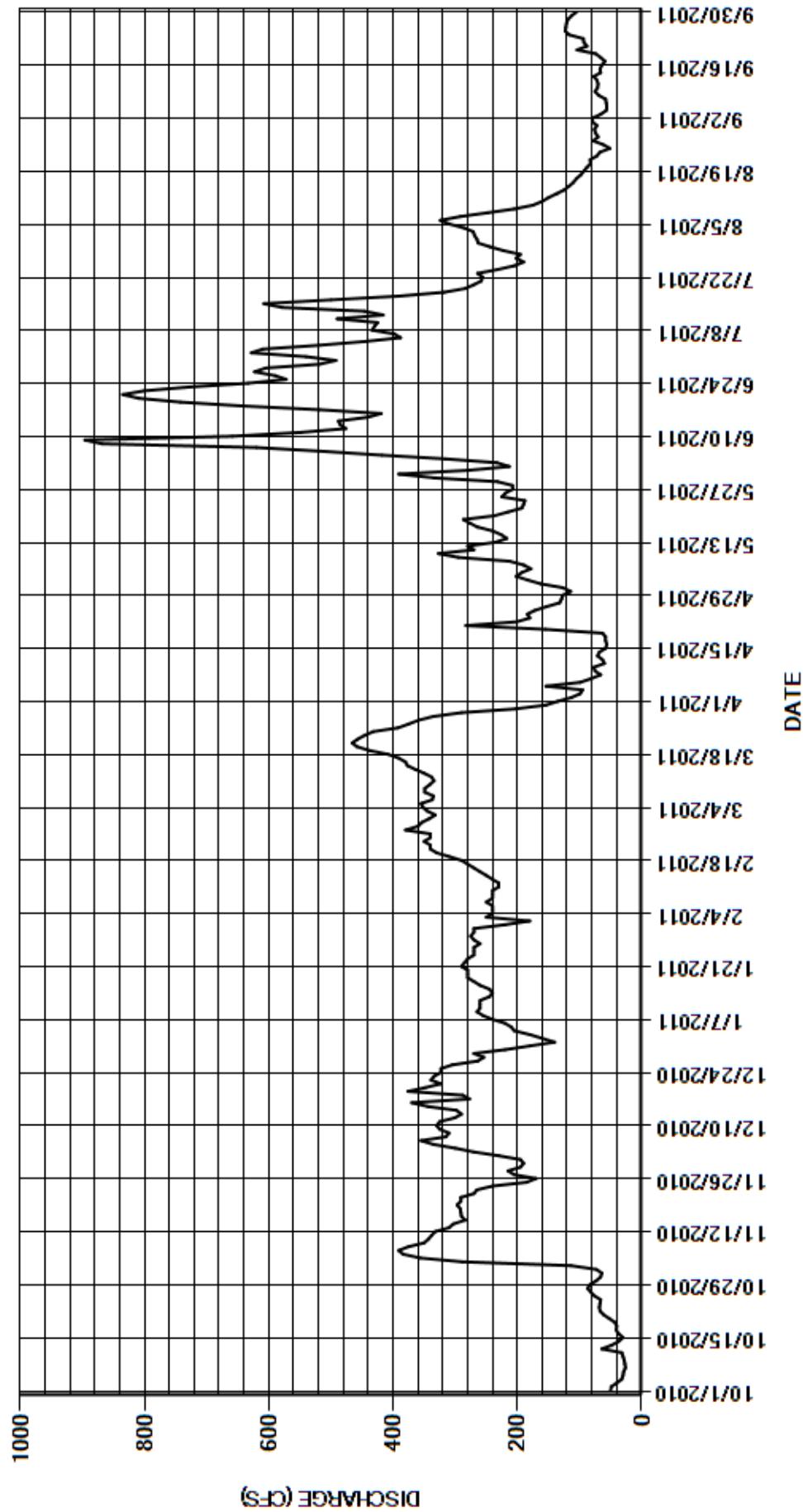
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	50	64	e195	e140	e220	342	135	127	278	540	265	79
2	49	73	e230	e160	e180	332	113	162	213	628	269	79
3	40	114	e270	e180	e250	345	99	183	233	610	271	66
4	32	289	e300	e205	e240	352	95	202	316	520	286	57
5	30	356	e335	e210	e240	355	154	193	418	446	309	56
6	29	384	e355	e220	e240	337	99	178	512	388	324	57
7	26	391	e315	e240	e250	335	81	190	620	398	292	58
8	27	375	e310	e255	e240	349	66	213	869	434	248	69
9	28	350	e325	e265	e240	349	75	295	896	430	205	75
10	30	343	e330	e260	e240	341	77	327	659	425	175	71
11	32	338	e325	e260	e230	334	60	270	549	490	160	70
12	64	332	301	e260	e230	338	63	280	476	416	150	72
13	48	310	290	e245	e240	350	71	235	485	446	137	77
14	37	303	298	e240	e250	364	68	217	488	579	125	66
15	30	284	344	e245	e260	377	58	226	441	608	117	67
16	37	290	370	e260	e270	380	56	240	419	500	110	64
17	41	291	277	e270	e280	391	58	264	519	390	105	59
18	40	292	288	e280	e290	408	58	276	645	318	98	66
19	43	297	376	e280	e310	438	63	287	742	284	93	74
20	52	291	348	e280	e330	458	155	237	809	270	88	104
21	61	291	323	e290	e340	466	283	215	835	258	82	88
22	67	e270	339	e285	e340	457	201	193	800	256	83	93
23	68	e265	334	e280	e350	446	180	190	727	264	72	94
24	67	e240	323	e270	e340	432	184	188	633	232	67	117
25	66	e185	323	e270	e340	392	172	225	572	205	51	123
26	76	e170	305	e270	e380	375	153	219	590	190	62	122
27	82	e205	264	e260	e360	359	132	207	623	202	78	121
28	87	e215	254	e270	354	335	129	208	605	195	70	119
29	83	e195	270	e275	---	290	127	232	519	222	74	113
30	73	e190	e220	e270	---	203	114	334	492	244	76	105
31	66	---	e180	e270	---	154	---	391	---	263	72	---
TOTAL	1561	7993	9317	7765	7834	11184	3379	7204	16983	11651	4614	2481
MEAN	50.4	266	301	250	280	361	113	232	566	376	149	82.7
AC-FT	3100	15850	18480	15400	15540	22180	6700	14290	33690	23110	9150	4920
MAX	87	391	376	290	380	466	283	391	896	628	324	123
MIN	26	64	180	140	180	154	56	127	213	190	51	56
CAL YR	2010	TOTAL	115719	MEAN	317	MAX	1560	MIN	22	AC-FT	229500	
WTR YR	2011	TOTAL	91966	MEAN	252	MAX	896	MIN	26	AC-FT	182400	

MAX DISCH: 988 CFS AT 06:15 ON JUN 09,2011 GH 2.71 FT SHIFT -0.09 FT

MAX GH: 2.76 FT AT 05:30 ON DEC 07,2010 (BACKWATER FROM ICE)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

08251500 RIO GRANDE RIVER NEAR LOBATOS
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
09118200 TARBELL DITCH NEAR COCHETOPA PASS
Water Year 2011

Location.--	Lat 37°59'33", long 106°47'37" referenced to North American Datum of 1983 (Halfmoon Pass, CO quad, scale 1:24,000), UTM Zone 13 342496 E and 4206511 N, in SE ¼ SE ¼ sec. 7, T.43 N., R.2 E., New Mexico Principal Meridian, Saguache County, CO, Hydrologic Unit 14020003, on left bank Tarbell ditch diverts water from Lake Fork Cocheta Creek (tributary to Cocheta Creek), in NW ¼ sec. 18, T.43 N., R.2 E., in Gunnison River basin, to Lake Fork Creek (tributary to Middle Fork Saguache Creek) in NE ¼ sec. 18, T.43 N., R.2 E., in Rio Grande basin.
Drainage Area and Period of Record.--	Drainage area not determined. WY 1949 to present.
Equipment.--	Data collection platform (Sutron Model Satlink2) and a float-operated shaft encoder in a lumber shelter and steel culvert pipe stilling well. A Stevens F-type chart recorder is also occasionally used. One intake pipe attaches well to 2.5 foot Parshall flume.
Hydrologic Conditions.--	This is a trans-mountain diversion gage and all flow is regulated.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log as backup. The only record for May 31 to June 6, 2011 is the F-type chart. Record is complete from May 31, 2011 when diversion started to Sep. 28, 2011 when DCP was turned off. The diversion headgate was closed on Aug. 27, 2011 but leakage continued through the flume until Aug. 31, 2011. There is some uncertainty during the period of May 31 to Jun. 6, 2011, before satellite system was started and recorder chart was primary record due to possible gage-height scale issue on recorder. There was no flow from Oct. 1, 2010 to May 30, 2011 and from Sep. 1 to Sep. 30, 2011.
Datum Corrections.--	No datum corrections since levels have not been run on this flume. The flume is in fair condition. The measured depths on measurement #40, made Jun. 6, 2011, indicate that flume floor is fairly level laterally. However, it has been noted that both flume walls are leaning from left to right. There is also a large flat rock placed at left side of flume entrance to prevent erosion, which affects velocities at left edge of flume.
Rating.--	Rating TARBELCO01, a standard 2.5 foot Parshall flume rating, was used all year. Sediment and rock above flume cause minor shifting. One discharge measurement (No. 40) was made this year, with a discharge of 5.88 cfs. The peak flow of 9.23 cfs occurred at 2030 on June 6, 2011 at a gage height of 1.02 ft with a shift of -0.07 ft. The peak exceeded measurement No. 40, made Jun. 6, 2011, by 0.24 ft in stage.
Discharge.--	Shifting control method was used during all periods of good record. The measured shift (-0.07 feet) was distributed through the entire period of record.
Special Computations.--	Daily mean discharge for May 31 through June 5, 2011 was determined by applying the measured shift (-0.07 feet) to the daily mean gage-height or partial day mean gage-height derived from the chart. On June 6, 2011, prior to starting DCP, the 15 minute unit stage values were read from the chart and entered into the records system.
Remarks.--	Record is fair, except for the period of May 31 to June 6, 2011 prior to starting DCP, which is poor due to questionable gage-height data. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	Cleaning the approach section including large rock on LEW may reduce shifting.

STATE OF COLORADO
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09118200 TARBELL DITCH NEAR COCHETOPA PASS

RATING TABLE-- TARBELCO01 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

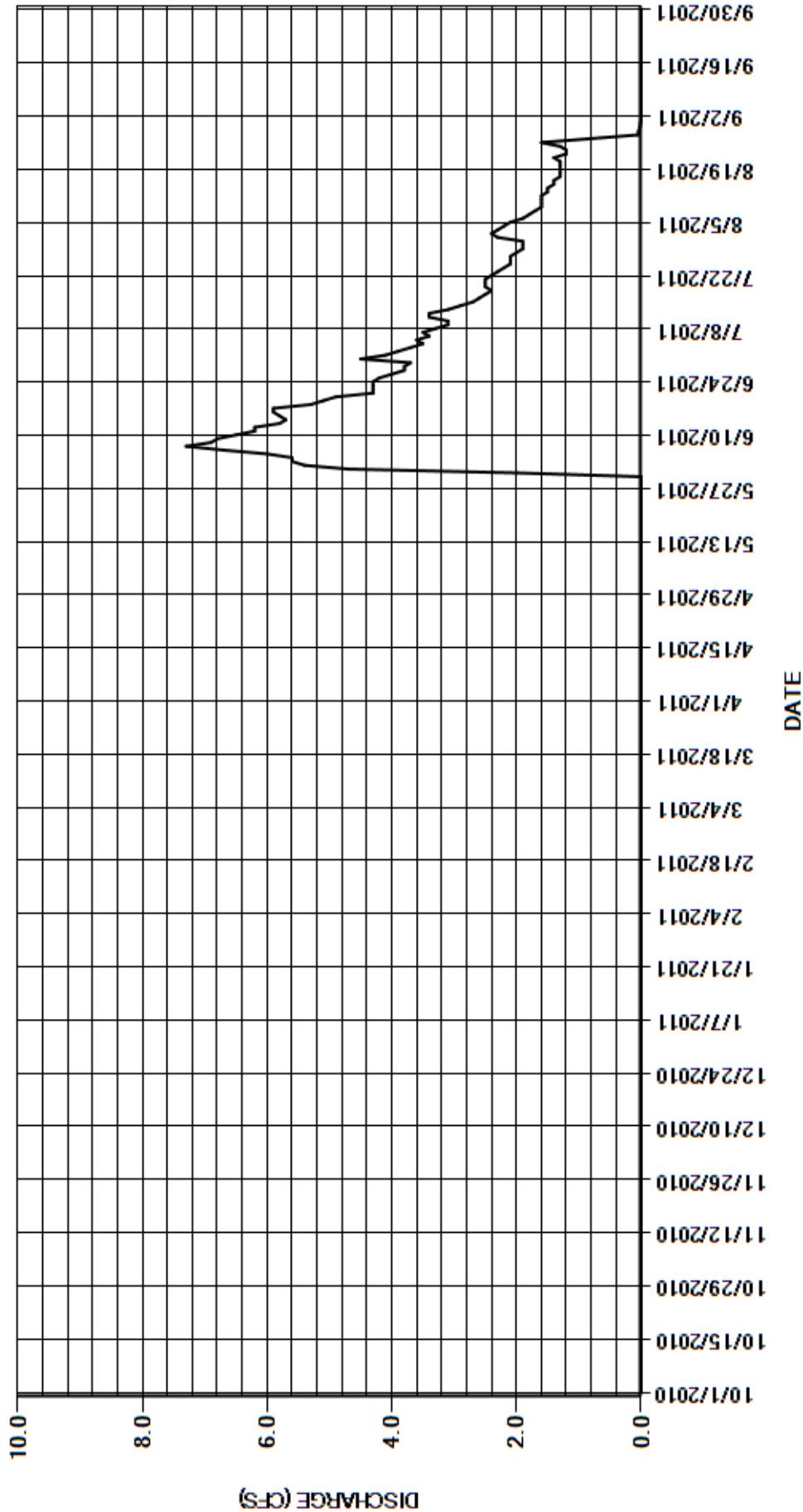
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.7	4.1	2.3	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.4	3.9	2.4	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.6	3.7	2.3	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.6	3.5	2.2	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.0	3.6	2.1	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.7	3.4	1.9	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.3	3.5	1.8	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.9	3.3	1.7	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.8	3.1	1.6	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.5	3.1	1.6	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.2	3.4	1.6	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.2	3.4	1.6	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.8	3.1	1.5	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.7	2.9	1.5	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.8	2.7	1.4	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.9	2.6	1.4	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.9	2.5	1.3	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.3	2.4	1.3	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.1	2.5	1.3	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.9	2.5	1.3	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.3	2.5	1.3	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.3	2.4	1.4	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.3	2.3	1.2	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.3	2.2	1.2	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.2	2.1	1.3	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.0	2.1	1.6	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	2.1	0.83	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	2.0	0.05	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	3.7	1.9	0.04	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	4.5	1.9	0.02	0.00
31	0.00	---	0.00	0.00	---	0.00	---	2.0	---	1.9	0.01	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	159.5	86.6	43.05	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.065	5.32	2.79	1.39	0.000
AC-FT	0	0	0	0	0	0	0	4.0	316	172	85	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.0	7.3	4.1	2.4	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.7	1.9	0.01	0.00
CAL YR	2010	TOTAL	374.89	MEAN	1.03	MAX	11	MIN	0.00	AC-FT	744	
WTR YR	2011	TOTAL	291.15	MEAN	0.80	MAX	7.3	MIN	0.00	AC-FT	577	

MAX DISCH: 9.23 CFS AT 20:30 ON JUN 06,2011 GH 1.02 FT SHIFT -0.07 FT

MAX GH: 1.02 FT AT 20:30 ON JUN 06,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09118200 TARBELL DITCH NEAR COCHETOPA PASS
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
09121000 TABOR DITCH AT SPRING CREEK PASS, CO
Water Year 2011

Location.--	Lat 37°56'22", long 107°9'31" referenced to North American Datum of 1983 (Slumgullion Pass, CO quad, scale 1:24,000), UTM Zone 13 310324 E and 4201303 N, in NE ¼ SE ¼ sec. 35, T.43 N., R.3 W., New Mexico Principal Meridian, Hinsdale County, CO, Hydrologic Unit 13010001, on left bank Tabor ditch diverts water from tributaries of Cebolla Creek in secs. 29 and 36, T.43 N., R.3 W., in Gunnison River basin, to Big Spring Creek (tributary to North Clear Creek) in sec. 35, T.43 N., R.3 W., in Rio Grande basin.
Drainage Area and Period of Record.--	Drainage area not determined. The period of record is from WY 1948 to present.
Equipment.--	Data collection platform (Sutron Satlink2) and float-operated shaft encoder in a steel shelter with stilling well. One intake pipe attaches well to 3 foot Parshall flume. Primary reference gage is staff gage in flume. Equipment owned by Colorado Division of Parks and Wildlife.
Hydrologic Conditions.--	This is a trans-mountain diversion and all flow is regulated.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP log as backup. Record is complete and reliable Oct. 1 - 13, 2010 and Apr. 20 to Sep. 30, 2011, except for Apr. 25-30, May 1-6, 10-15, 20-22, 2011, when float was affected by ice in well. One erroneous unit value was corrected on Aug. 19. On Apr. 26 the shaft encoder was incorrectly set at 0.90 instead of 0.09 feet and then corrected on Apr. 27. A -0.81 foot gage-height correction was applied to this period. There were several instrument corrections made ranging from -0.02 to +0.04 feet mostly due to variable leakage from stilling well. These corrections were prorated by time from previous visit. There was no flow from Oct. 14, 2010 to Apr. 19, 2011.
Datum Corrections.--	Levels were not run this year. Levels were last run at the flume on July 31, 2008.
Rating.--	Rating TABDITCO01, a standard 3 foot Parshall flume rating, was used all year. Settlement of the flume throat section and siltation of the gage pool which has increased approach velocities are the likely causes of positive shifting. Eight measurements (Nos. 160-167) were made this year ranging in discharge from 0.53 to 7.7 cfs. Measurements cover the range experienced except for the lower daily flows on Oct. 1-7, 11-13, 2010 and Apr. 20, 25-30, May 1-5, 10-14, 19-22, Sep. 21-23, 2011; and the higher daily flows on May 29, Jun. 2-7, 2011. The peak flow of 17.3 cfs occurred at 2000 on Jun. 6, 2011 at a gage height of 1.18 ft. with a shift of +0.08 feet. It exceeded high measurement No. 162 (GH=0.68 ft.) made Jun. 3, 2011 by 0.50 ft. in stage.
Discharge.--	Shifting control method was used during all record periods. Shifts were applied as defined by discharge measurements and distributed by time. This year's measurements show shifts varied between +0.03 and +0.11 ft. All were given full weight, except Nos. 160, 162, 163, and 166 which were adjusted by as much as 8% to smooth shift distribution.
Special Computations.--	Flows during periods when float was affected by ice in well were estimated using temperature records. The final discharge value on Oct. 13, 2010 was adjusted by 0.01 cfs in order for the 2011 Water Year values to match the final 2010 Calendar Year values. The small discrepancy was due to mathematical differences between the old system using hourly average values and the new system using 15 minute unit values for daily mean discharge calculation.
Remarks.--	Record is fair, except for periods of low flows (< 1 cfs) and unreliable gage heights due to ice in well, which are poor. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	The quality of this record would be greatly improved by leveling the flume, cleaning the approach pool, and resolving the leaking well/inlet issue.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09121000 TABOR DITCH AT SPRING CREEK PASS, CO

RATING TABLE-- TABDITCO01 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.49	0.00	0.00	0.00	0.00	0.00	0.00	e0.30	7.4	2.0	1.2	0.58
2	0.49	0.00	0.00	0.00	0.00	0.00	0.00	e0.20	10	1.9	1.7	0.57
3	0.49	0.00	0.00	0.00	0.00	0.00	0.00	e0.30	8.0	1.8	1.6	0.55
4	0.49	0.00	0.00	0.00	0.00	0.00	0.00	e0.40	8.5	1.7	1.7	0.55
5	0.49	0.00	0.00	0.00	0.00	0.00	0.00	e0.50	11	1.7	1.6	0.55
6	0.49	0.00	0.00	0.00	0.00	0.00	0.00	e0.60	12	1.7	1.5	0.56
7	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.89	8.6	1.6	1.3	0.58
8	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.92	7.0	1.5	1.1	0.55
9	0.54	0.00	0.00	0.00	0.00	0.00	0.00	0.76	6.6	1.4	0.95	0.56
10	0.53	0.00	0.00	0.00	0.00	0.00	0.00	e0.40	6.1	1.3	0.87	0.55
11	0.51	0.00	0.00	0.00	0.00	0.00	0.00	e0.30	5.9	1.8	0.79	0.55
12	0.50	0.00	0.00	0.00	0.00	0.00	0.00	e0.30	5.3	2.0	0.73	0.55
13	0.28	0.00	0.00	0.00	0.00	0.00	0.00	e0.40	4.7	1.7	0.71	0.56
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e0.50	4.6	1.5	0.74	0.57
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e0.70	4.7	1.4	0.79	0.56
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	4.8	1.3	0.71	0.55
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.90	4.2	1.2	0.68	0.55
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.64	3.9	1.1	0.66	0.55
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51	3.7	1.2	0.73	0.55
20	0.00	0.00	0.00	0.00	0.00	0.00	e0.31	e0.30	3.3	1.1	0.75	0.53
21	0.00	0.00	0.00	0.00	0.00	0.00	0.72	e0.40	3.2	1.1	0.75	0.51
22	0.00	0.00	0.00	0.00	0.00	0.00	0.76	e0.50	3.0	1.0	0.76	0.49
23	0.00	0.00	0.00	0.00	0.00	0.00	0.77	0.77	2.9	0.93	0.74	0.49
24	0.00	0.00	0.00	0.00	0.00	0.00	0.74	0.73	2.8	0.86	0.74	0.53
25	0.00	0.00	0.00	0.00	0.00	0.00	e0.40	0.93	2.6	0.79	0.72	0.55
26	0.00	0.00	0.00	0.00	0.00	0.00	e0.40	1.6	2.5	0.77	0.74	0.55
27	0.00	0.00	0.00	0.00	0.00	0.00	e0.40	3.0	2.3	0.99	0.72	0.55
28	0.00	0.00	0.00	0.00	0.00	0.00	e0.40	6.2	2.2	1.0	0.73	0.56
29	0.00	0.00	0.00	0.00	---	0.00	e0.40	8.0	2.2	0.77	0.68	0.55
30	0.00	0.00	0.00	0.00	---	0.00	e0.40	6.4	2.1	0.76	0.63	0.55
31	0.00	---	0.00	0.00	---	0.00	---	4.4	---	0.93	0.62	---
TOTAL	6.35	0.00	0.00	0.00	0.00	0.00	5.70	43.75	156.1	40.80	28.64	16.45
MEAN	0.20	0.000	0.000	0.000	0.000	0.000	0.19	1.41	5.20	1.32	0.92	0.55
AC-FT	13	0	0	0	0	0	11	87	310	81	57	33
MAX	0.55	0.00	0.00	0.00	0.00	0.00	0.77	8.0	12	2.0	1.7	0.58
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	2.1	0.76	0.62	0.49

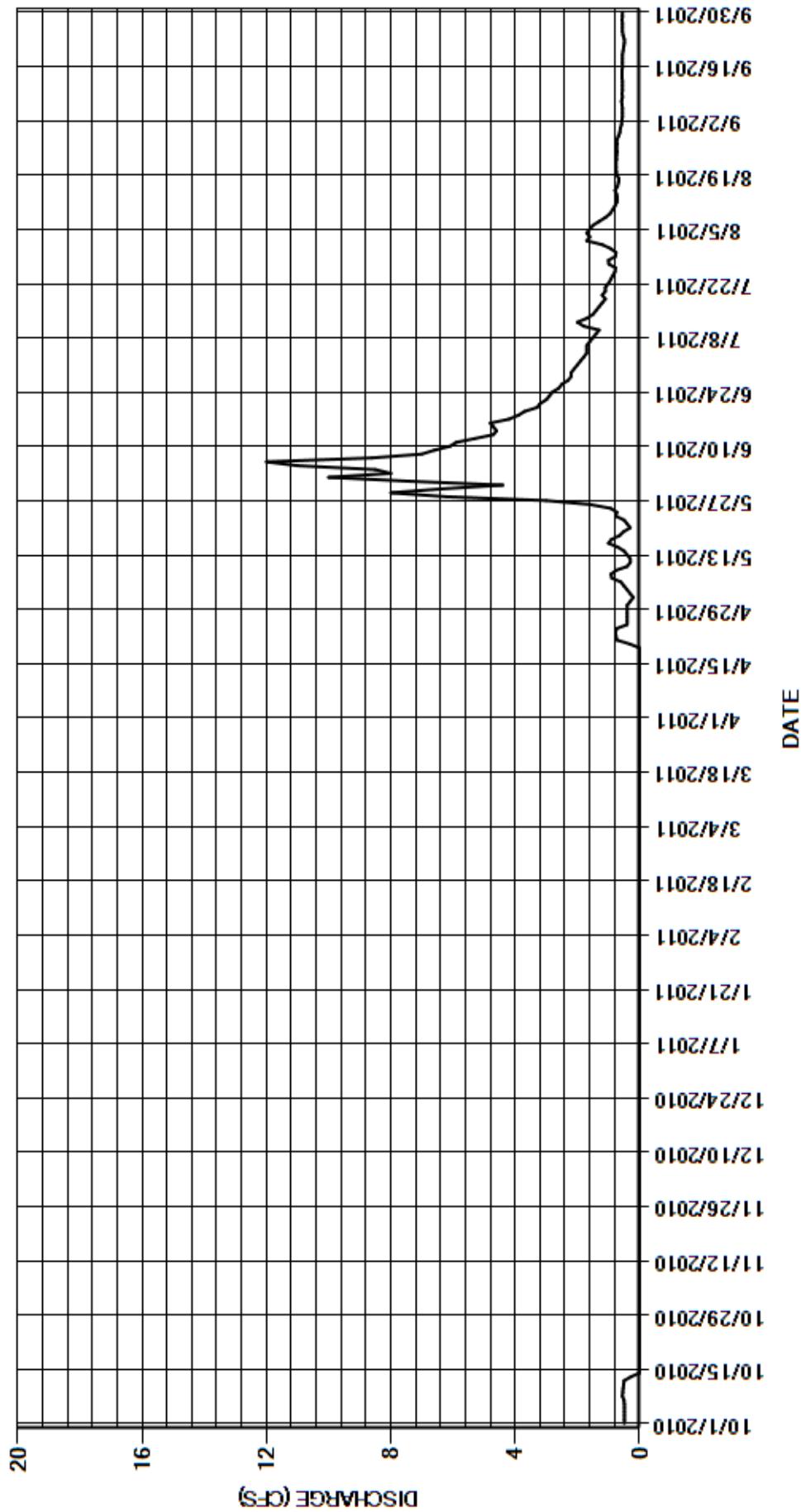
CAL YR	2010	TOTAL	250.85	MEAN	0.69	MAX	11	MIN	0.00	AC-FT	498
WTR YR	2011	TOTAL	297.79	MEAN	0.82	MAX	12	MIN	0.00	AC-FT	591

MAX DISCH: 17.3 CFS AT 20:00 ON JUN 06,2011 GH 1.18 FT SHIFT 0.08 FT

MAX GH: 1.18 FT AT 20:00 ON JUN 06,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09121000 TABOR DITCH AT SPRING CREEK PASS, CO
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
09341000 TREASURE PASS DITCH AT WOLF CREEK PASS
Water Year 2011

Location.--	Lat 37°28'58", long 106°47'59" referenced to North American Datum of 1983 (Wolf Creek Pass, CO quad, scale 1:24,000), UTM Zone 13 340869 E and 4149940 N, in SW ¼ NW ¼ sec. 5, T.37 N., R.2 E., New Mexico Principal Meridian, Mineral County, CO, Hydrologic Unit 13010001, on right bank Treasure Pass Ditch diverts water tributary to Wolf Creek and the San Juan River drainage across the Continental Divide to Pass Creek and the South Fork Rio Grande River drainage.
Drainage Area and Period of Record.--	Drainage area not determined. WY 1948 to present.
Equipment.--	Float-operated Stevens F-type chart recorder in small steel shelter and stilling well. One intake pipe attaches well to 2 foot Parshall flume. Primary reference gage is staff gage in flume. New flume and stilling well installed at same location on Sep. 1, 2010.
Hydrologic Conditions.--	This is a trans-mountain diversion and all flow is regulated.
Gage-Height Record.--	Primary record is graphic F-type chart record with no back up. Record is complete and reliable from Jun. 6 to Jul. 17, 2011 and from Aug. 21 to 28, 2011.
Datum Corrections.--	No datum corrections since levels have not been run on this flume. The flume was replaced Sep. 1, 2010 and is in good condition. There is no stilling pool above flume so approach velocity is high.
Rating.--	A standard 2 foot Parshall flume rating, was used all year. Changes in approach conditions above flume cause shifting. The peak flow of 8.88 cfs occurred at 1745 on June 11, 2011 at a gage height of 1.02 ft with a shift of +0.05 ft. The maximum gage height occurred at 1445 June 11, 2011 but was assumed affected by backwater from snow in channel and therefore not considered as peak flow. The peak flow exceeded measurement No. 29 made June 28, 2011 (GH 0.65 ft.) by 0.37 ft in stage.
Discharge.--	Shifting control method was used during all periods of record. There was no flow Oct. 1, 2010 to Jun. 5, 2011, Jul. 18 to Aug. 25, and Aug. 29 to Sep. 30, 2011. The measured shift (+0.05 feet) was distributed through all periods of flow.
Special Computations.--	Daily mean discharge was determined by applying the measured shift (+0.05 feet) to the daily mean gage-height or partial day mean gage-height derived from the chart.
Remarks.--	Record is poor due to only one measurement and unfavorable approach conditions causing a standing wave in flume that moves upstream/downstream at varying flows. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	Record would be improved by solving approach condition problem, installing electronic instrumentation, and making measurements throughout the flow range.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09341000 TREASURE PASS DITCH AT WOLF CREEK PASS

RATING TABLE-- STD02FTP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

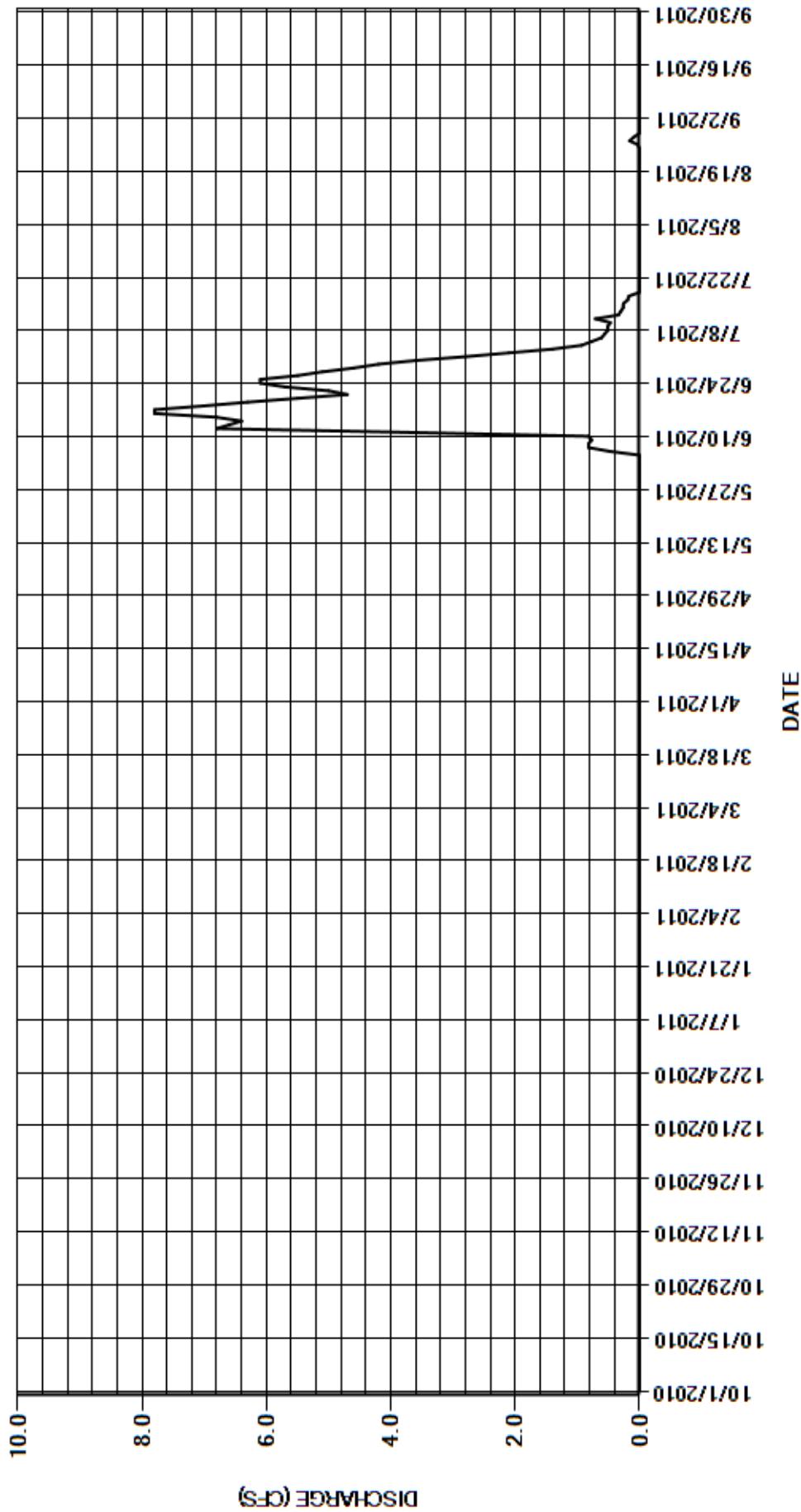
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.8	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.4	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.93	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.77	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.48	0.61	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.82	0.56	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.82	0.51	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.77	0.51	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.82	0.47	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	e3.7	0.71	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.8	0.34	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.6	0.30	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.4	0.26	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.8	0.26	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.8	0.19	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.8	0.17	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.0	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.3	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.5	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.7	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.0	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.7	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.1	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.1	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.5	0.00	0.03	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.1	0.00	0.16	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.6	0.00	0.09	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	4.2	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	3.6	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	119.01	12.89	0.28	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.97	0.42	0.009	0.000
AC-FT	0	0	0	0	0	0	0	0	236	26	0.6	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.8	2.8	0.16	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAL YR	2010	TOTAL	92.06	MEAN	0.25	MAX	8.5	MIN	0.00	AC-FT	183	
WTR YR	2011	TOTAL	132.18	MEAN	0.36	MAX	7.8	MIN	0.00	AC-FT	262	

MAX DISCH: 8.88 CFS AT 17:45 ON JUN 11,2011 GH 1.02 FT SHIFT 0.05 FT

MAX GH: 1.51 FT AT 14:45 ON JUN 11,2011 (Backwater affected)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09341000 TREASURE PASS DITCH AT WOLF CREEK PASS
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
DON LA FONT DITCH NO. 1 AT PIEDRA PASS
Water Year 2011

Location.-- Lat 37°34'9", long 107°0'17" referenced to North American Datum of 1983 (Palomino Mountain, CO quad, scale 1:24,000), UTM Zone 13 322967 E and 4159909 N, in SW ¼ SE ¼ sec. 32, T.39 N., R.1 W., New Mexico Principal Meridian, Mineral County, CO, Hydrologic Unit 14080102, on bank 17.8 mi southwest of Wagon Wheel Gap, CO.

Drainage Area and Period of Record.-- Drainage area not determined. 1951 to present.

Equipment.-- Float-operated Sutron SDR data logger in a CMP shelter and metal pipe stilling well. One intake pipe attaches well to 9 inch Parshall flume. Primary reference gage is a staff gage in Parshall flume. All equipment is owned and maintained by Colorado Division of Parks and Wildlife (DPW).

Hydrologic Conditions.-- This is a trans-mountain diversion and all flow is regulated.

Gage-Height Record.-- Primary record is 15-minute logged SDR data with no backup. Record is complete and reliable May 31 to Jul. 4, 2011. A -0.01 instrument correction was made to SDR on Jun. 23, 2011. This correction was prorated by time from May 31, 2011, when the diversion was started.

Datum Corrections.-- No datum corrections. Levels have not been run on this flume.

Rating.-- Rating STD09INPF, a standard 9 inch Parshall flume rating, was used all year. One measurement (No. 12) was made this year with a discharge of 1.65 cfs and a shift of -0.02 feet. The peak flow of 4.37 cfs occurred at 1630 on Jun. 11, 2011 at a gage height of 1.28 feet and a shift of -0.02 feet. It exceeded measurement No. 12 (GH=0.69) made Jun. 23, 2011 by 0.59 feet in stage.

Discharge.-- Shifting control method was used during all periods of record. The measured shift (-0.02 feet) from measurement No. 12 was distributed through entire period of record. There was no flow Oct. 1, 2010 to May 30, 2011 and Jul. 5 to Sep. 30, 2011.

Special Computations.-- In order for correct daily discharge values to be calculated on days that record started and stopped, 15-minute gage heights of 0 feet were added before and after the actual start and stop times to the primary stage import file.

Remarks.-- Record is good. Station maintained cooperatively by Colorado Parks and Wildlife and Div. 3 hydrographic staff. Record developed by Div. 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

DON LA FONT DITCH NO. 1 AT PIEDRA PASS

RATING TABLE-- STD09INPF USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

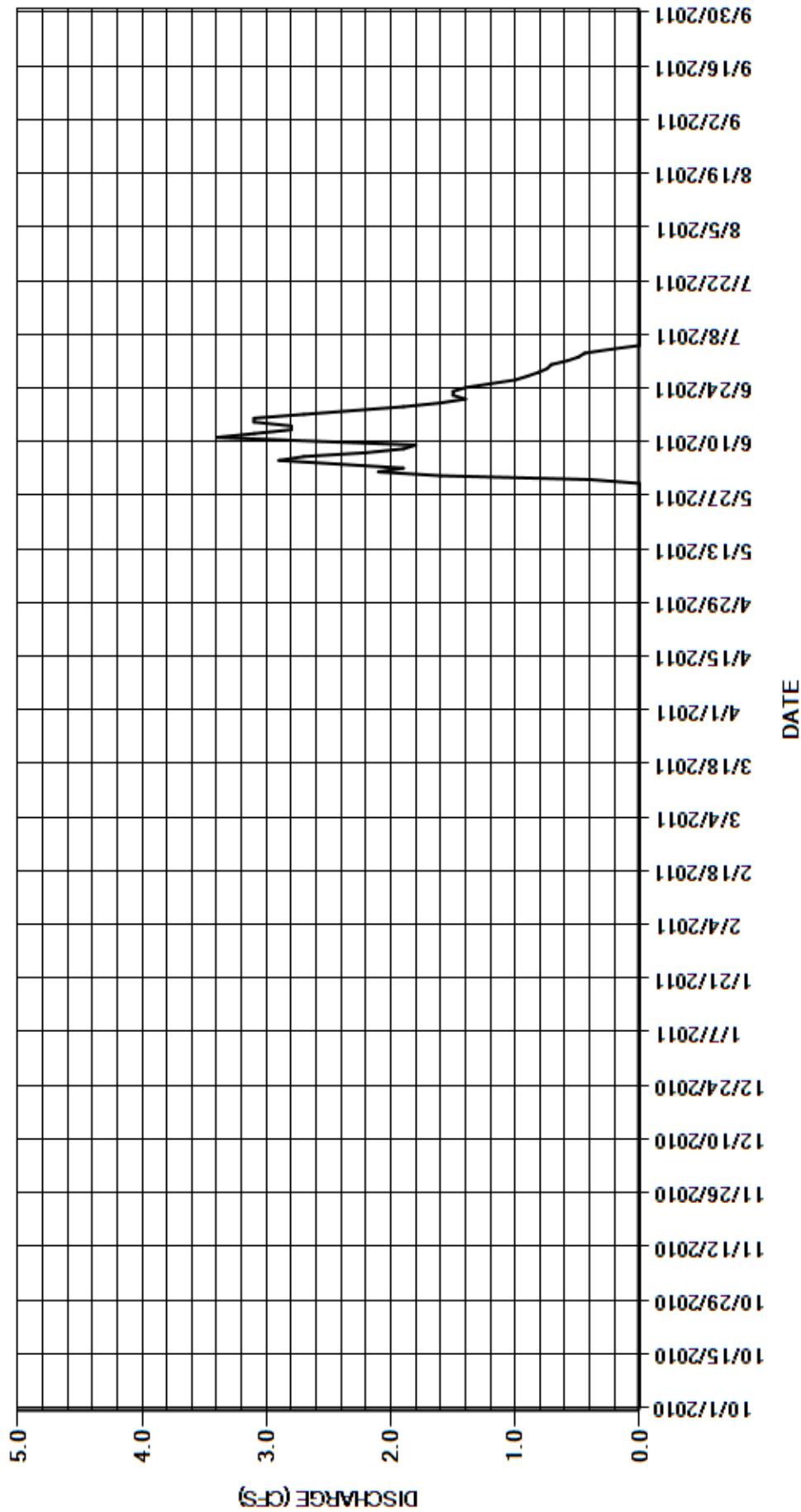
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.6	0.58	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	0.49	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.9	0.44	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.4	0.23	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.9	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.7	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.2	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.9	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.8	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.6	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.4	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.1	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.8	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.8	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.1	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.1	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.7	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.3	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.9	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.6	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.4	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.5	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.5	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.4	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.2	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.90	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.81	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.74	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.71	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.40	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	60.06	1.74	0.00	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013	2.00	0.056	0.000	0.000
AC-FT	0	0	0	0	0	0	0	0.8	119	3.5	0	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	3.4	0.58	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00
CAL YR	2010	TOTAL	0.00	MEAN	0.000	MAX	0.00	MIN	0.00	AC-FT	0	
WTR YR	2011	TOTAL	62.20	MEAN	0.17	MAX	3.4	MIN	0.00	AC-FT	123	

MAX DISCH: 4.37 CFS AT 16:30 ON JUN 11,2011 GH 1.28 FT SHIFT -0.02 FT

MAX GH: 1.28 FT AT 16:30 ON JUN 11,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

DON LA FONT DITCH NO. 1 AT PIEDRA PASS
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
09347000 DON LA FONT DITCH NO. 2 AT PIEDRA PASS
Water Year 2011

Location.-- Lat 37°34'21", long 106°59'57" referenced to North American Datum of 1983 (South River Peak, CO quad, scale 1:24,000), UTM Zone 13 323451 E and 4160264 N, in NE ¼ SE ¼ sec. 32, T.39 N., R.1 W., New Mexico Principal Meridian, Mineral County, CO, Hydrologic Unit 13010001, on right bank 17.5 mi southwest of Wagon Wheel Gap, CO. Diversion is from tributaries of Piedra River in San Juan River Basin to Red Mountain Creek in Rio Grande River Basin.

Drainage Area and Period of Record.-- Drainage area not determined. 1963 to present.

Equipment.-- Data collection platform (Sutron Model 8200 DCP with GOES radio) and a float-operated Sutron SDR in a wood shelter and metal pipe stilling well. One intake pipe attaches well to 1.5 foot Parshall flume. The only reference gage is a staff gage in Parshall flume. All equipment is owned and maintained by Colorado Division of Parks and Wildlife (DPW).

Hydrologic Conditions.-- This is a trans-mountain diversion gage and all flow is regulated.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP and SDR logs as backup. Record is complete and reliable from Jun. 10 to Jul. 26, 2011. A -0.03 feet instrument correction was made to the SDR on Jun. 23, 2011. This correction was prorated by time from Jun. 10, 2011, when the diversion was started.

Datum Corrections.-- No datum corrections. Levels have not been run at this flume.

Rating.-- Rating STD01HFTP, a standard 1.5 foot Parshall flume rating, was used all year. One discharge measurement (No. 18) was made this year with a discharge of 2.99 cfs and a shift of 0 feet. The peak flow of 7.94 cfs occurred at 1615 on Jun. 10, 2011 at a gage height of 1.20 feet with a shift of 0 feet. The peak exceeded measurement No. 18, made on Jun. 23, 2011, by 0.56 feet in stage.

Discharge.-- Shifting control method was used during entire period of record. The measured shift (0 feet) from measurement No. 18 was distributed through all record. There was no flow Oct. 1, 2010 through Jun. 9, 2011 and Jul. 27 through Sep. 30, 2011.

Special Computations.-- In order for correct daily discharge values to be calculated on days that record started and stopped, 15-minute gage heights of 0 feet were added before and after the actual start and stop times to the primary stage import file.

Remarks.-- Record is good, except for periods of flow below 1 cfs should be considered fair to poor. Station cooperatively maintained by Colorado Division of Parks and Wildlife and Div 3 hydrographic staff. Record developed by Scott Veneman.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09347000 DON LA FONT DITCH NO. 2 AT PIEDRA PASS

RATING TABLE-- STD01HFTP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.4	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.2	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.87	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.84	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.72	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.68	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.8	0.61	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.8	0.70	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.4	0.59	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.0	0.49	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.9	0.44	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.1	0.39	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.2	0.35	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.4	0.33	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.8	0.29	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.1	0.29	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.4	0.29	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.3	0.29	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.3	0.26	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.2	0.26	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.9	0.26	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.6	0.28	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.3	0.14	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.9	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	1.7	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	1.7	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	71.90	15.02	0.00	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.40	0.48	0.000	0.000
AC-FT	0	0	0	0	0	0	0	0	143	30	0	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.4	1.4	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

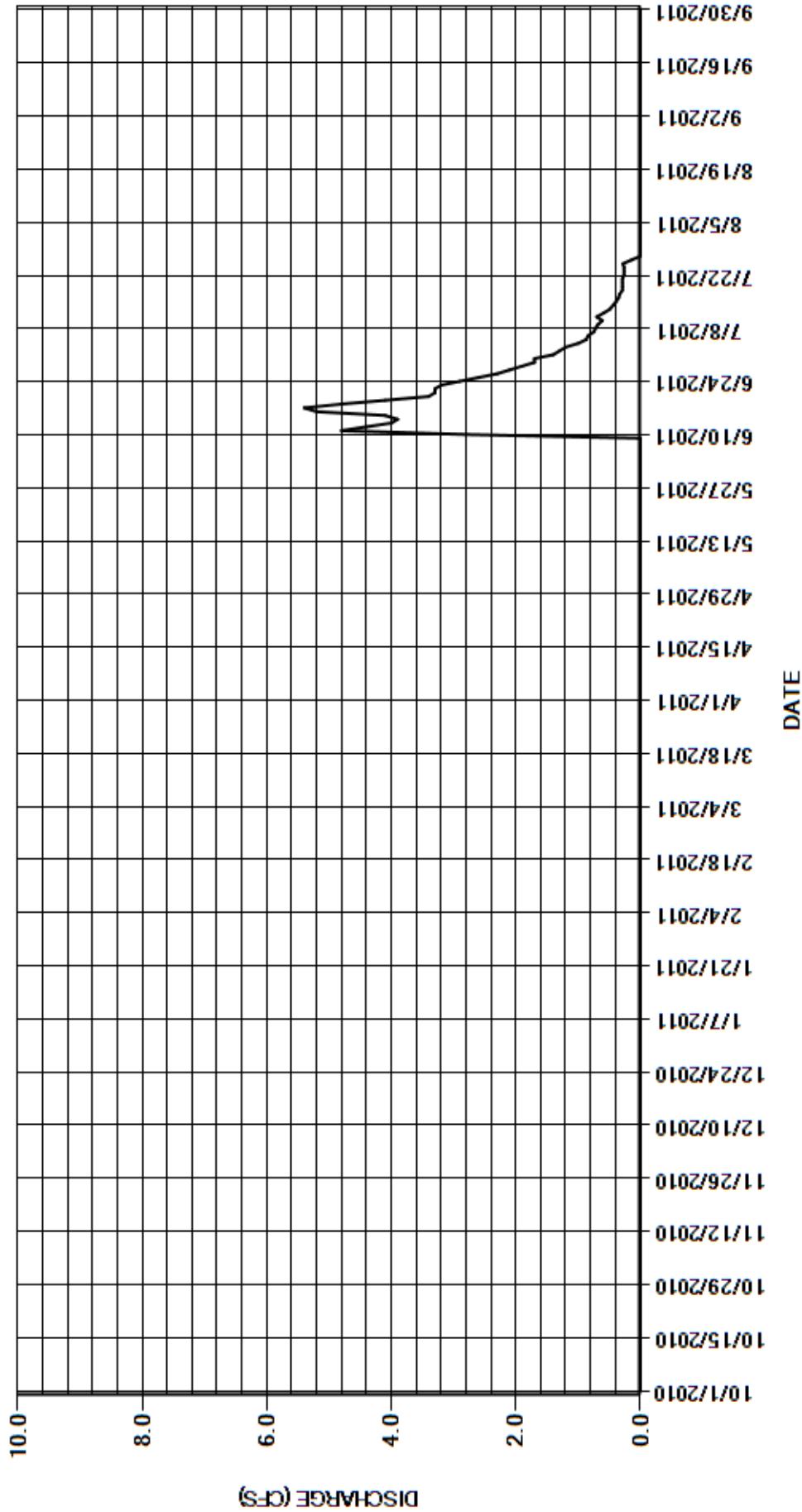
CAL YR	2010	TOTAL	11.28	MEAN	0.031	MAX	1.0	MIN	0.00	AC-FT	22
WTR YR	2011	TOTAL	86.92	MEAN	0.24	MAX	5.4	MIN	0.00	AC-FT	172

MAX DISCH: 7.94 CFS AT 16:15 ON JUN 10,2011 GH 1.20 FT SHIFT 0 FT

MAX GH: 1.20 FT AT 16:15 ON JUN 10,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09347000 DON LA FONT DITCH NO. 2 AT PIEDRA PASS
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
DON LA FONT DITCH AT PIEDRA PASS (COMBINED)
Water Year 2011

Location.--	Don La Font ditches 1 and 2 divert water from tributaries of Piedra River between headgates in NW $\frac{1}{4}$ sec. 4, T.38 N., R.1 W., and SW $\frac{1}{4}$ sec. 33, T.39 N., R.1 W., and Piedra pass, in San Juan River basin, to Red Mountain Creek in sec. 33, T.39 N., R.1 W., in Rio Grande basin.
Drainage Area and Period of Record.--	N/A
Equipment.--	Combined record is from Don La Font Ditches 1 and 2 gages. See individual station analyses for gage equipment descriptions.
Hydrologic Conditions.--	This is a combined trans-mountain diversion and all flow is regulated. Don La Font Ditches 1 and 2 divert water from tributaries of Piedra River in San Juan River Basin (Division 7) to Red Mountain Creek in Rio Grande River Basin (Division 3).
Gage-Height Record.--	See individual station analyses.
Datum Corrections.--	See individual station analyses.
Rating.--	See individual station analyses.
Discharge.--	Daily discharges computed by summing and rounding individual station daily discharges.
Special Computations.--	A day is considered estimated if the estimated portion of a daily sum is greater than 10% of the daily sum.
Remarks.--	Record is good, except for periods of flow below 1 cfs should be considered fair to poor. Record developed by Scott Veneman.
Recommendations.--	

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

DON LA FONT DITCH AT PIEDRA PASS (COMBINED)

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

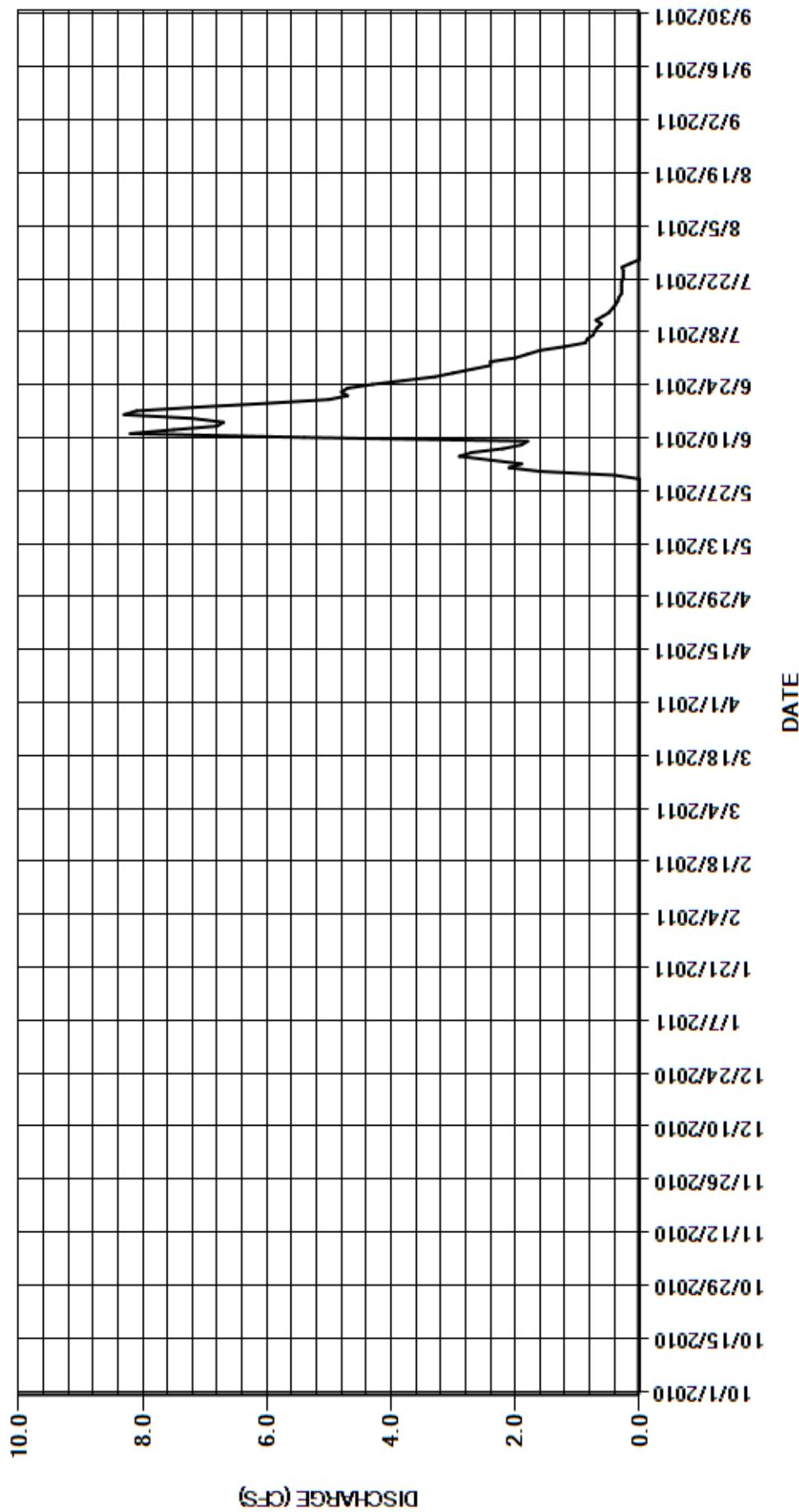
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.6	2.0	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	1.8	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.9	1.6	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.4	1.2	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.9	0.87	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.7	0.84	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.2	0.75	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.9	0.72	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.8	0.68	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.4	0.61	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.2	0.70	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.5	0.59	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.8	0.49	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.7	0.44	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.2	0.39	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.3	0.35	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.1	0.33	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.1	0.29	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.0	0.29	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.0	0.29	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.7	0.29	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.8	0.26	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.7	0.26	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.3	0.26	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.8	0.28	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.3	0.14	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.7	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	2.4	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	2.4	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.40	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	131.9	16.72	0.00	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013	4.40	0.54	0.000	0.000
AC-FT	0	0	0	0	0	0	0	0.8	262	33	0	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	8.3	2.0	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.6	0.00	0.00	0.00
CAL YR	2010	TOTAL	11.28	MEAN	0.031	MAX	1.0	MIN	0.00	AC-FT	22	
WTR YR	2011	TOTAL	149.02	MEAN	0.41	MAX	8.3	MIN	0.00	AC-FT	296	

MAX DISCH:

MAX GH: 0.00 FT

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

DONLA FONT DITCH AT PIEDRA PASS (COMBINED)
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
09348000 WILLIAM'S CREEK-SQUAW PASS DITCH AT SQUAW PASS
Water Year 2011

Location.-- Lat 37°36'0", long 107°13'4" referenced to North American Datum of 1983 (Cimarrona Peak, CO quad, scale 1:24,000), UTM Zone 13 304215 E and 4163748 N, in NE ¼ SE ¼ sec. 20, T.39 N., R.3 W., New Mexico Principal Meridian, Hinsdale County, CO, Hydrologic Unit 14080102, on right bank William's Creek-Squaw Pass ditch diverts water from William's Creek (tributary to Piedra River) in sec. 21, T.39 N., R.3 W., in San Juan River basin, to Squaw Creek in sec. 21, T.39 N., R.3 W., in Rio Grande basin.

Drainage Area and Period of Record.-- Drainage area not determined. 1948 to present.

Equipment.-- Data collection platform (Sutron 8200) with satellite telemetry, which records gage height data from a float-operated shaft encoder in a wood shelter with metal pipe stilling well. One intake pipe attaches well to 2 foot Parshall flume. The primary reference gage is the staff gage in flume.

Hydrologic Conditions.-- This is a trans-mountain diversion gage and all flow is regulated.

Gage-Height Record.-- Primary record is 15-minute transmitted data with DCP log as backup. Record is complete and reliable from Jun. 2, 2011 when diversion started to Aug. 28, 2011 when DCP malfunctioned due to low battery. The DCP occasionally transmitted erroneous data from this point until Sep. 25, 2011 when the diversion and gage was closed for the season. A -0.02 ft instrument correction was made on Jun. 29, 2011, so a -0.02 foot shaft encoder correction (SEC) was prorated from Jun. 2 - 29, 2011.

Datum Corrections.-- No datum corrections since levels have not been run on this flume. The flume is in fair condition and the depths recorded on this year's measurement indicate that it is fairly level laterally.

Rating.-- Rating WCSDITCO02, which is not a standard Parshall Flume rating, was used all year. This rating is based on historic measurements taking into account the inherent excessive approach velocities and conditions. Changes in approach conditions above flume and deposition below flume cause minor shifting. One discharge measurement (No. 32) was made this year, with a discharge of 5.85 cfs. This measurement yielded a shift of -0.01 feet. The peak flow of 11.7 cfs occurred at 1445 on Aug. 27, 2011 at a gage height of 1.04 feet with a shift of -0.01 feet. The peak exceeded measurement No. 32, made June 29, 2011, by 0.34 feet in stage.

Discharge.-- Shifting control method was used during all periods of good record. The measured shift (-0.01 feet) from Measurement No. 32 was distributed through the entire period of record. There was no flow from Oct. 1, 2010 to Jun. 1, 2011 and from Aug. 29 to Sep. 30, 2010.

Special Computations.-- The daily mean discharges for the period from Aug. 29 to Sep. 25, when DCP was occasionally transmitting erroneous data was estimated as 0 cfs.

Remarks.-- Record is good, except for periods of missing and unreliable gage-height, and periods when flow is less than 0.5 cfs, which are poor. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09348000 WILLIAM'S CREEK-SQUAW PASS DITCH AT SQUAW PASS

RATING TABLE-- WCSDITCO02 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

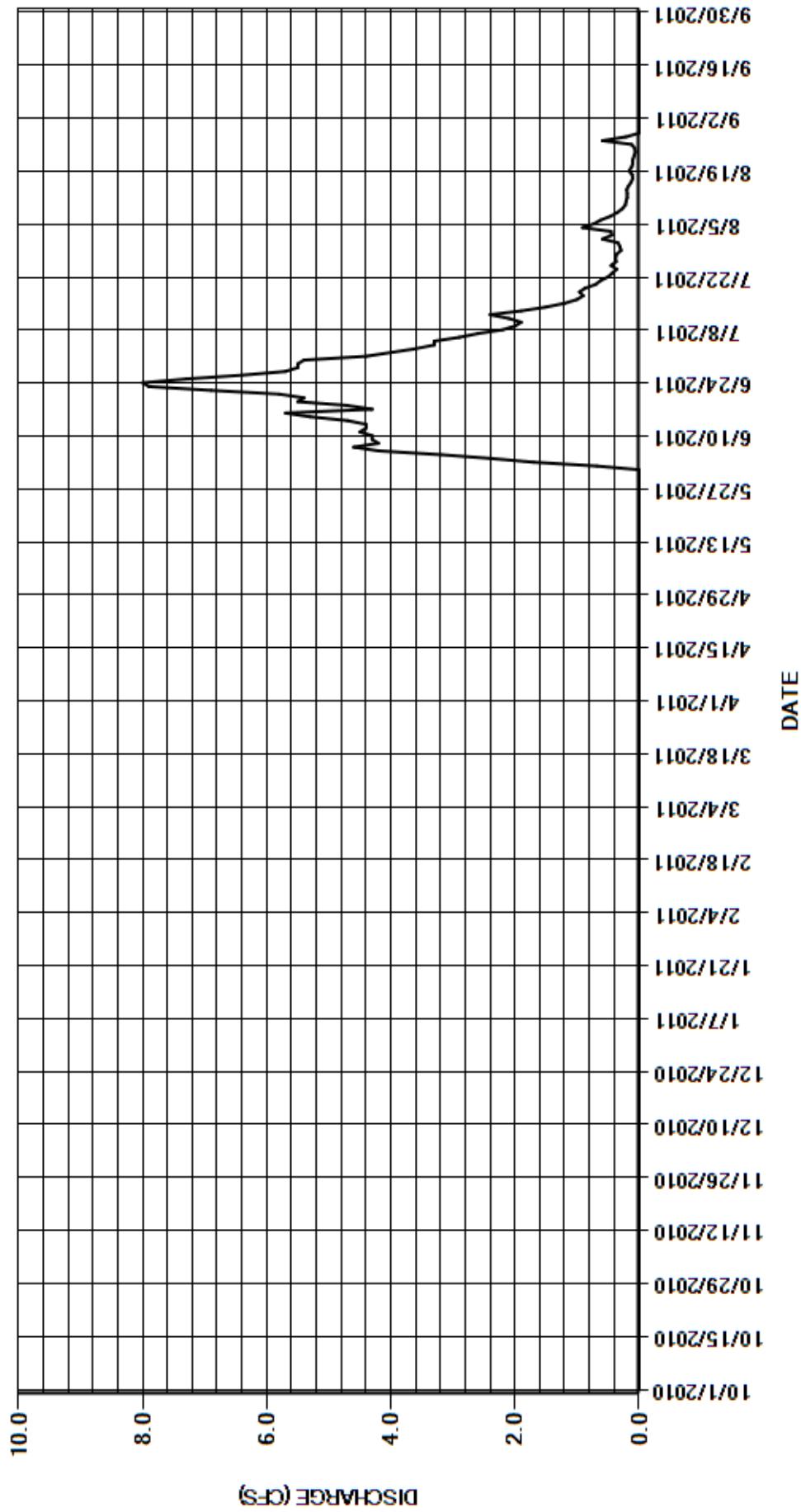
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.4	0.59	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.68	4.0	0.44	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.7	3.6	0.45	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.4	3.3	0.91	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.2	3.3	0.73	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.2	2.9	0.62	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.6	2.6	0.46	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.2	2.2	0.35	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.3	2.0	0.27	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.3	1.9	0.22	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.5	2.1	0.21	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.4	2.4	0.19	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.4	1.9	0.19	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.7	1.5	0.20	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.3	1.2	0.17	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.7	1.0	0.13	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.3	0.90	0.10	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.7	0.96	0.11	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.5	0.87	0.16	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.4	0.70	0.12	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.8	0.62	0.10	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.9	0.50	0.10	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.9	0.43	0.08	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.0	0.36	0.06	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.3	0.45	0.07	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.4	0.37	0.12	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.7	0.38	0.59	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.5	0.36	0.21	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	5.5	0.29	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	5.4	0.31	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	0.34	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	142.88	48.14	7.95	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.76	1.55	0.26	0.000
AC-FT	0	0	0	0	0	0	0	0	283	95	16	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.0	4.4	0.91	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.00
CAL YR	2010	TOTAL	152.92	MEAN	0.42	MAX	8.3	MIN	0.00	AC-FT	303	
WTR YR	2011	TOTAL	198.97	MEAN	0.55	MAX	8.0	MIN	0.00	AC-FT	395	

MAX DISCH: 11.7 CFS AT 14:45 ON AUG 27,2011 GH 1.04 FT SHIFT -0.01 FT

MAX GH: 1.04 FT AT 14:45 ON AUG 27,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09348000 WILLIAM'S CREEK-SQUAW PASS DITCH AT SQUAW PASS
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
09351000 PINE RIVER WEMINUCHE PASS DITCH AT WEMINUCHE PASS
Water Year 2011

Location.--	Lat 37°40'43", long 107°19'4" referenced to North American Datum of 1983 (Weminuche Pass, CO quad, scale 1:24,000), UTM Zone 13 295602 E and 4172671 N, in NW ¼ SW ¼ sec. 33, T.40 N., R.4 W., New Mexico Principal Meridian, Hinsdale County, CO, Hydrologic Unit 14080101, on right bank Pine River-Weminuche Pass ditch diverts water from right bank of north fork of Los Pinos River in sec. 4, T.39 N., R.4 W., in San Juan River basin, to Weminuche Creek in sec. 33, T.40 N., R.4 W., in Rio Grande basin.
Drainage Area and Period of Record.--	Drainage area not determined. Water year 1948 to present.
Equipment.--	Data collection platform (Sutron Satlink2) and float-operated SDR in a wood shelter with stilling well. One intake pipe attaches well to 3 foot Parshall flume. Primary reference gage is staff gage in flume.
Hydrologic Conditions.--	This is a trans-mountain diversion and all flow is regulated.
Gage-Height Record.--	Primary record is 15-minute transmitted data with DCP and SDR logs as backup. Record is complete and reliable Oct. 1 - 11, 2010 when system turned off, and Jun. 1 when diversion and system started through Sep. 30, 2011. The diversion was turned off on Jul. 5, 2011 due to being out of priority. During 'no-flow' periods, the gage-height did not drop below 0.08 to 0.09 feet. It was assumed that a deposit of silt in the well prevented the shaft encoder float from dropping below that gage-height. There was no flow from Oct. 1, 2010 to May 31, 2011, and Jul. 6 through Sep. 30, 2011. The SDR was set to wrong value on Jun. 1 and corrected on Jun. 8, 2011, so a +0.30 ft instrument correction was applied through this period.
Datum Corrections.--	No datum corrections since levels have not been run on this flume. The flume is in good condition, but is susceptible to submergence due to sediment deposition in ditch below flume.
Rating.--	Rating PRWDITCO04, a standard 3 foot Parshall flume rating, was used all year. Changes in approach conditions above flume and deposition below flume cause shifting. No discharge measurements were made this year due to difficult access and diversion turning off early. The peak flow of 9.48 cfs occurred at 2015 on Jun. 8, 2011 at a gage height of 0.90 feet with a shift of -0.04 feet.
Discharge.--	The shift (-0.04 feet) was distributed through this year's period of record.
Special Computations.--	The shift (-0.04 feet) was used since it is a good representation of recent historic shifts during free-flow conditions. The last measured shift (-0.11 feet) on Jun. 9, 2010 was due to submergence caused by downstream conditions. The ditch below the flume was cleaned last year after this measurement, but a measurement has not been made since that time.
Remarks.--	Record is fair due to no measurements and the assumed shift after cleaning ditch. Station maintained and record developed by Div 3 hydrographic staff.
Recommendations.--	More measurements throughout the flow range would improve the accuracy of this record.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09351000 PINE RIVER WEMINUCHE PASS DITCH AT WEMINUCHE PASS

RATING TABLE-- PRWDITCO04 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	3.2	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	2.7	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.69	2.6	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.63	2.4	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.63	1.3	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.61	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.4	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.1	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.7	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.3	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.2	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.6	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.2	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.1	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.1	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.9	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.2	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.9	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.5	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.5	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.9	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.6	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.4	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.0	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.5	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.1	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.7	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	3.5	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	3.6	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	142.41	12.20	0.00	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.75	0.39	0.000	0.000
AC-FT	0	0	0	0	0	0	0	0	282	24	0	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.1	3.2	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.00	0.00	0.00

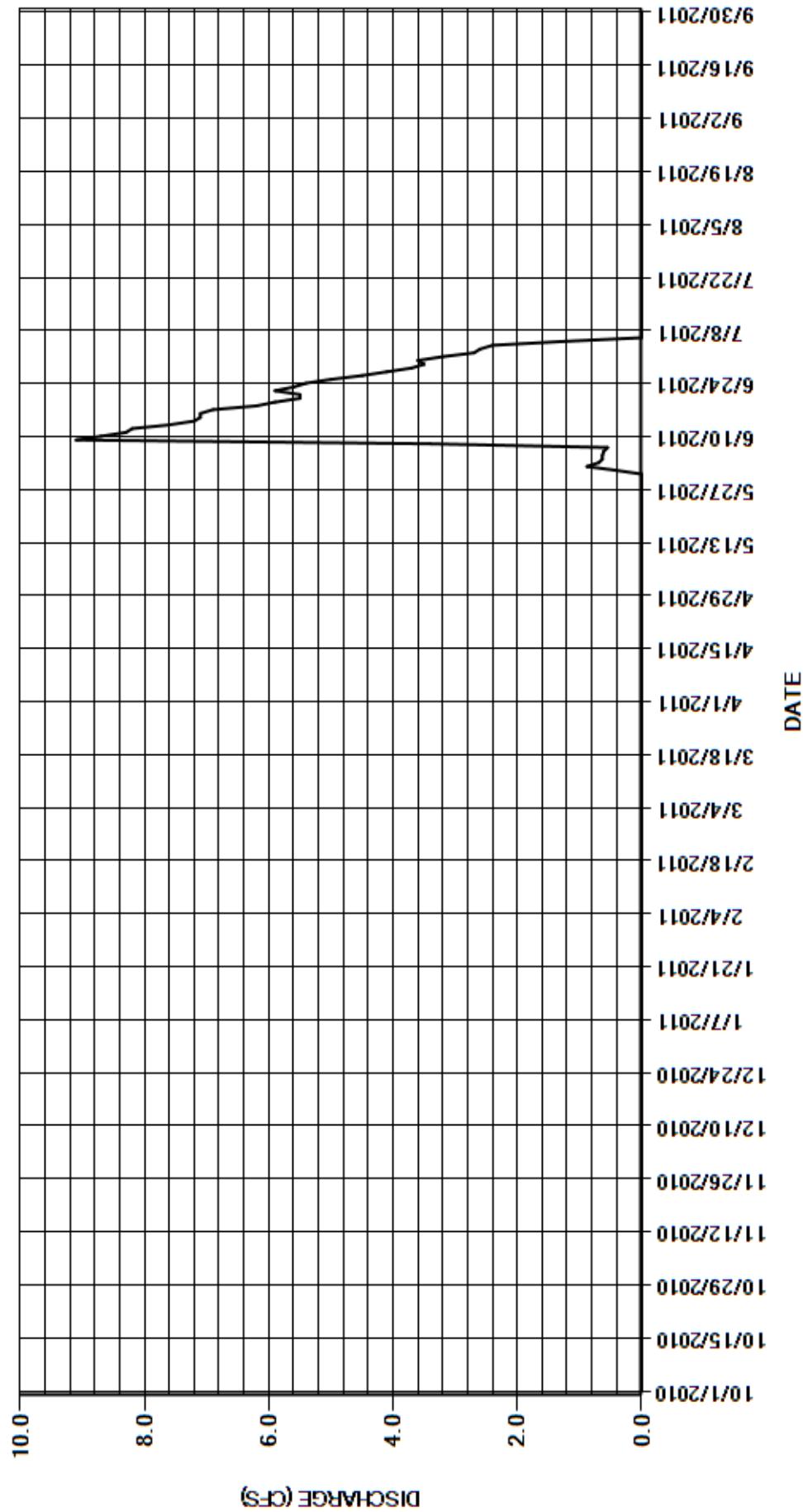
CAL YR	2010	TOTAL	138.06	MEAN	0.38	MAX	11	MIN	0.00	AC-FT	274
WTR YR	2011	TOTAL	154.61	MEAN	0.42	MAX	9.1	MIN	0.00	AC-FT	307

MAX DISCH: 9.48 CFS AT 20:15 ON JUN 08,2011 GH 0.90 FT SHIFT -0.04 FT

MAX GH: 0.90 FT AT 20:15 ON JUN 08,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09351000 PINE RIVER WEMINUCHE PASS DITCH AT WEMINUCHE PASS
WY2011 HYDROGRAPH



RIO GRANDE RIVER BASIN
09351500 WEMINUCHE PASS DITCH AT WEMINUCHE PASS
Water Year 2011

Location.-- Lat 37°40'45", long 107°19'18" referenced to North American Datum of 1983 (Weminuche Pass, CO quad, scale 1:24,000), UTM Zone 13 295260 E and 4172755 N, in NW ¼ SW ¼ sec. 33, T.40 N., R.4 W., New Mexico Principal Meridian, Hinsdale County, CO, Hydrologic Unit 14080101, on left bank Weminuche Pass ditch diverts water from left bank of Los Pinos River in sec. 5, T.39 N., R.4 W., in San Juan River basin, to Weminuche Creek in sec. 28, T.40 N., R.4 W., in Rio Grande basin.

Drainage Area and Period of Record.-- Drainage area not determined. 1948 to present.

Equipment.-- Electronic data logger with satellite transmitter, which records gage height data from a float-operated SDR in a CMP shelter and stilling well. One intake pipe attaches well to 5 foot Parshall flume.

Hydrologic Conditions.-- This is a trans-mountain diversion and all flow is regulated.

Gage-Height Record.-- Primary record is 15-minute logged SDR data with no backup. The DCP was not used this year. Record is complete and reliable from Jun. 3 - 9, 2011. The ditch above the gage washed out on Jun. 6 and the diversion was turned off on Jun. 9, 2011.

Datum Corrections.-- No datum corrections. Levels have not been run at this flume.

Rating.-- Rating STD05FTP, a standard 5 foot Parshall flume rating, was used all year. Changes in approach conditions above flume cause minor shifting. There was no discharge measurements made this year. Since 1997, eight measurements have been made and the shifts varied from -0.01 to -0.03 feet. The peak flow of 47.3 cfs occurred at 1645 on Jun. 6, 2011 at a gage height of 1.75 feet with a shift of -0.03 feet. This peak occurred just prior to the ditch above the gage washing out.

Discharge.-- Shifting control method was used during all periods of record. Last year's measured shift (-0.03 feet) was distributed through all record. There was no flow from Oct. 1, 2010 to Jun. 2, 2011 and from Jun. 10 to Sep. 30, 2011.

Special Computations.-- In order for correct daily discharge values to be calculated on days that record started and stopped, 15-minute gage heights of 0 feet were added before and after the actual start and stop times to the primary stage import file.

Remarks.-- Record is fair due to no visits by DWR hydrographic staff. Station maintained and record developed by Div 3 hydrographic staff.

Recommendations.--

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09351500 WEMINUCHE PASS DITCH AT WEMINUCHE PASS

RATING TABLE-- STD05FTP USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	38	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.1	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.90	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.45	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	0.00	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	115.45	0.00	0.00	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.85	0.000	0.000	0.000
AC-FT	0	0	0	0	0	0	0	0	229	0	0	0
MAX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	38	0.00	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

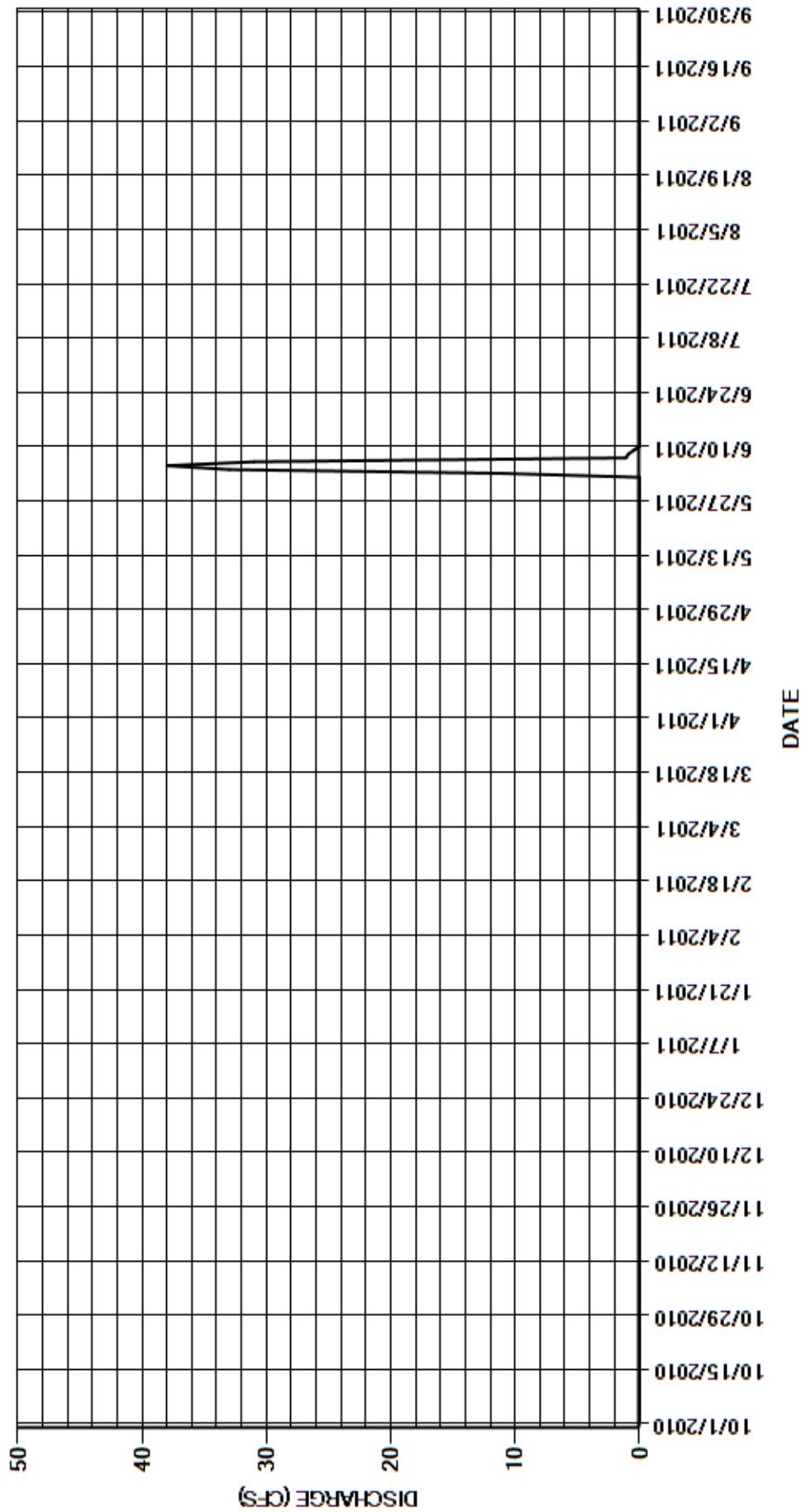
CAL YR	2010	TOTAL	329.30	MEAN	0.90	MAX	25	MIN	0.00	AC-FT	653
WTR YR	2011	TOTAL	115.45	MEAN	0.32	MAX	38	MIN	0.00	AC-FT	229

MAX DISCH: 47.3 CFS AT 16:45 ON JUN 06,2011 GH 1.75 FT SHIFT -0.03 FT

MAX GH: 1.75 FT AT 16:45 ON JUN 06,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09351500 WEMINUCHE PASS DITCH AT WEMINUCHE PASS
WY2011 HYDROGRAPH



GUNNISON RIVER BASIN
09131490 MUDDY CREEK ABOVE PAONIA RESERVOIR
Water Year 2011

Location.--	Lat. 38°59'15", Long. 107°20'52.8", in the NE $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec 28, T.12 S., R.89 W. Sixth Principal Meridian, in Gunnison County on the right bank 750 ft. downstream from county bridge and 1,400 ft. upstream from high water line of Paonia Reservoir.
Drainage Area and Period of Record.--	246 square miles or about 157,440 acres (from the US Bureau of Reclamation) Published by the Colorado Division of Water Resources, Office of the State Engineer since 1991.
Equipment.--	A Sutron Satlink 2 High Data Rate DCP along with a Sutron Stage Discharge Recorder (SDR) and a Sutron Constant Flow Bubbler (CFB). The SDR and CFB store data and are used for backup purposes. The primary reference gage is a steel drop tape. The station is also equipped with an air temperature sensor. There were no changes this year.
Hydrologic Conditions.--	The basin is composed of conifer and aspen forest to open sagebrush hillsides. There is about 3,000 acres under irrigation diversion and return flows for mountain grass hay up stream. A very large land slide continues to encroach from the east about four miles upstream. This process is more active in the spring and during high ground water conditions.
Gage-Height Record.--	The primary record is the 15-minute satellite data with SDR download data as backup. The record is complete and reliable, except for periods when ice affected the stage-discharge relationship: Nov 18, 19, 23-30; Dec 1-9, 13, 17, 18, 20-24, 29-31, 2010; Jan 1-14, 18-31; Feb 1-17, 20-23, 27; Mar 1, 2, 2011. There were four primary sensor calibration corrections and three flush corrections this year. The SDR was corrected on Jan 13, 2011, Apr 8, 2011, Jul 22, 2011 and Aug 31, 2011. These were in the range of -0.01 to 0.02 ft. The flush corrections were made on May 25, 2011, Jun 14, 2011 and Jul 11, 2011. These ranged from 0.05 to 0.11 ft.
Datum Corrections.--	Levels were not run this year. Levels were last run to the adjustable RP, located inside the gage shelter, on August 28, 2007, using the RP as the base.
Rating.--	The stream bed is composed of medium to large sized cobble. During spring runoff the channel is fairly stable at the gage. There is an encroaching shelf of cobble moving downstream from above. The left bank is flat at the gage and then pinches into a steep cliff about 50 feet downstream. The right bank is flat brush and mixed conifer. The channel will overtop the right bank at high water. When this happens, water has been up to a foot deep around the gage house. During low flows in the range of 10 to 20 cfs an irregular medium cobble riffle is a section control about 10 to 20 feet below the gage. During medium flows the channel is the control. During high flows the channel is the control with some influence by the brush on the right side and the constriction of the cliff on the left side. During extremely high flows, the brush on the right, the cliff on the left and a large boulder on the left have a greater influence on the stage-discharge relationship. Heavy sediments are deposited in the gage pool when the velocities drop. The slope of the channel doesn't allow the sediment to completely bury the cobble, but it does significantly smooth the stream bed. Rating MUDAPRC08B was used the entire water year. There were 12 measurements (Nos. 385 – 396) made this year. They cover the range in discharge from 20.3 to 728 cfs. They cover the range in stage experienced, except the lower daily flows of Oct 2-7, Nov 18, 26, 27, 2010 and the higher daily flows of May 7-10, 15-18, 26-31 and Jun 1-14, 2011. The instantaneous peak flow of 1,800 cfs occurred at 2215 on May 29, 2011 at a gage height of 8.41 ft. with a shift of +0.06 ft. It exceeded the stage of measurement No. 393 made May 29, 2011 by 1.23 ft.
Discharge.--	Shifting control method was used during the entire water year. Shifting is caused mainly by erosion and deposition of silt in gage pool above the control. Shifts were distributed by time with consideration given to changes in stage. Shifts were distributed by time from 0000 on Oct 1, 2010 to 1145 on May 4, 2011 and from 1300 on Sep 28, 2011 to 2345 on Sep 30, 2011. There were two variable shift tables used to distribute shifts by stage the rest of the water year. These were MUDAPRvs11a (applied from 1200 on May 4, 2011 to 1145 on Jun 14, 2011) and MUDAPRvs11b (applied from 1200 on Jun 14, 2011 to 1245 on Sep 28, 2011). All measurements were given full weight and applied directly except Nos. 385, 390, 391 and 394 which were discounted from -5% to 11% to smooth shift distribution. Measurement 392 was not used. The shift from measurement no. 387 was not used because the stage-discharge relationship was affected by ice.
Special Computations.--	Discharge during ice-affected periods were estimated using partial day record, adjacent good days, and temperatures data collected at this site. The ice period of Muddy Creek above Paonia Reservoir was compared to the calculated inflow and whenever the raw value was greater than the calculated value, that period was evaluated. A spreadsheet was used to calculate the inflow into Paonia Reservoir and was compared to the flows recorded at the gage. The flows were calculated using the change in storage for Paonia Reservoir minus the outflow released from the reservoir. The outflow released from the reservoir was recorded by the Muddy Creek below Paonia Reservoir (MUDBPRCO).
Remarks.--	The record is rated good, except for the periods when the stage-discharge relationship was affected by ice, which was estimated and should be considered poor. Gage maintained and operated by Gerald M. Thrush, Stephen W. Tuck and Luke M. Reschke. The record was developed by Gerald M. Thrush.
Recommendations.--	A bank operated cableway would produce much higher quality high water measurements than the bridge site.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09131490 MUDDY CREEK ABOVE PAONIA RESERVOIR

RATING TABLE.-- MUDAPRCC008B USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

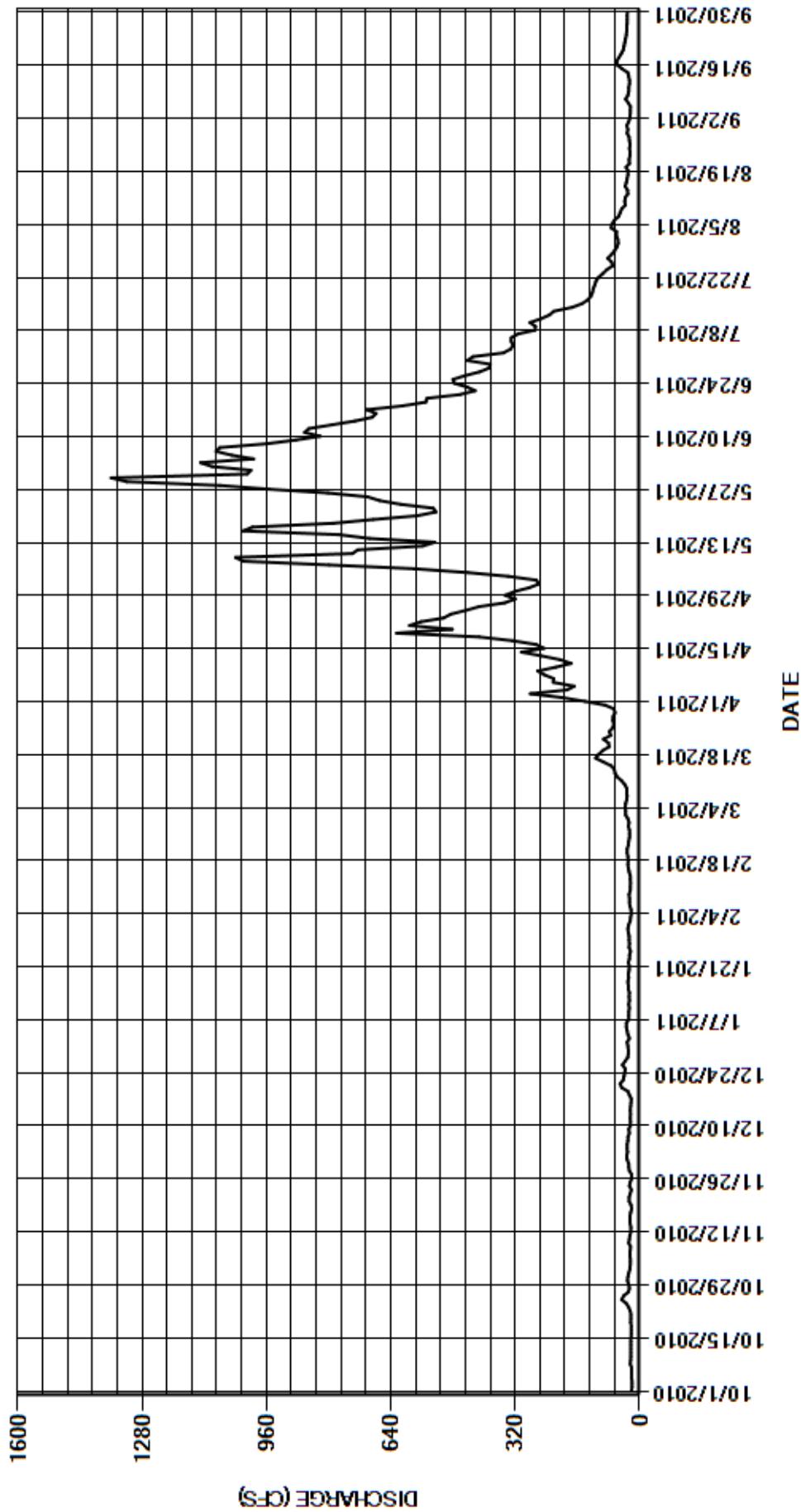
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	21	28	e32	e32	e28	e30	141	284	1000	429	56	28
2	19	25	e33	e26	e24	e36	200	258	1100	350	60	25
3	19	24	e31	e30	e23	36	281	266	1130	332	59	24
4	20	24	e32	e32	e21	37	187	338	993	325	73	24
5	20	24	e32	e34	e22	36	168	442	1050	330	71	23
6	20	25	e30	e34	e25	33	222	579	1090	330	65	29
7	20	24	e30	e28	e26	32	221	799	1080	313	54	36
8	24	23	e26	e28	e26	33	245	1020	960	269	50	30
9	23	28	e28	e28	e27	33	262	1040	884	268	46	28
10	22	26	23	e26	e24	38	216	739	822	282	37	28
11	22	25	23	e28	e24	46	176	725	862	254	38	26
12	22	22	24	e26	e23	57	205	558	851	232	37	26
13	22	22	e23	e27	e24	63	253	527	792	221	30	28
14	22	24	24	e26	e24	65	304	695	733	174	31	30
15	22	25	23	29	e27	73	246	774	688	148	37	45
16	21	25	22	29	e29	93	266	1020	678	133	34	57
17	21	23	e21	30	e30	113	327	996	702	125	32	59
18	21	e20	e26	e28	29	105	413	788	611	121	30	53
19	23	e22	30	e29	30	95	625	686	550	119	29	47
20	22	27	e46	e27	e32	78	482	572	547	115	35	42
21	22	27	e50	e26	e32	80	592	524	462	112	26	40
22	24	24	e42	e29	e29	93	563	531	423	105	27	38
23	28	e21	e40	e26	e28	74	504	614	444	94	25	36
24	34	e26	e38	e26	26	78	486	669	477	84	24	34
25	46	e24	37	e23	26	69	447	700	480	69	26	33
26	41	e20	44	e27	26	66	413	802	449	72	24	33
27	29	e20	37	e26	e29	69	347	953	411	82	26	32
28	26	e26	30	e27	27	68	320	1080	387	72	27	32
29	28	e28	e29	e27	---	63	346	1320	384	64	32	32
30	31	e28	e29	e29	---	66	321	1360	443	58	30	31
31	30	---	e30	e30	---	89	---	1010	---	55	33	---
TOTAL	765	730	965	873	741	1947	9779	22669	21483	5737	1204	1029
MEAN	24.7	24.3	31.1	28.2	26.5	62.8	326	731	716	185	38.8	34.3
AC-FT	1520	1450	1910	1730	1470	3860	19400	44960	42610	11380	2390	2040
MAX	46	28	50	34	32	113	625	1360	1130	429	73	59
MIN	19	20	21	23	21	30	141	258	384	55	24	23
CAL YR	2010	TOTAL	39407	MEAN	108	MAX	967	MIN	14	AC-FT	78160	
WTR YR	2011	TOTAL	67922	MEAN	186	MAX	1360	MIN	19	AC-FT	134700	

MAX DISCH: 1800 CFS AT 22:15 ON MAY 29,2011 GH 8.41 FT SHIFT 0.06 FT

MAX GH: 8.41 FT AT 22:15 ON MAY 29,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09131490 MUDDY CREEK ABOVE PAONIA RESERVOIR
WY2011 HYDROGRAPH



GUNNISON RIVER BASIN

09131500 MUDDY CREEK BELOW PAONIA RESERVOIR

Water Year 2011

Location.--	Lat. $38^{\circ}56'26''$, Long. $107^{\circ}21'24''$ in the SE $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 8, T.13 S., R. 89 W. (in Gunnison County on the right hand bank), and about 100 feet above county bridge and about 1100 feet below Paonia Reservoir outlet.
Drainage Area and Period of Record.--	257 square miles and published by the Office of the State Engineer, Colorado Division of Water Resources since 1995.
Equipment.--	Graphic water-stage recorder and shaft encoder on separate floats in a 42-inch CMP shelter and well. Satellite telemetry equipment is housed in a NEMA box attached to the outside of the CMP shelter. The primary reference gage is steel drop tape referenced to an adjustable reference point inside the gage house. The secondary reference gage is a bank-operated cantilever outside chain gage located just upstream of the station. The Stage Discharge Recorder operates from a separate float. No changes this water year.
Hydrologic Conditions.--	The control is a concrete ramp flume. Flows are completely controlled by Paonia Reservoir until the reservoir spills.
Gage-Height Record.--	The primary record is the 15-minute satellite data with the DCP log, chart record and SDR log are used for backup purposes. The record is complete and reliable except when the stage-discharge relation was affected by ice build up on the control on Feb 2-5, 10, 19, 20, 2011. There was one stage discharge recorder correction, and no flush corrections. The SDR calibration correction was made as follows: -0.01 ft. at 1627 on Feb. 24, 2011.
Datum Corrections.--	No levels were run this water year. Levels were last run on August 28, 2007.
Rating.--	During higher flows approaching 800 cfs the banks neck down and the county road bridge piers act as a compound control. The rating table MUDBPRCO09A in use since Oct. 1, 2005, was used for all of water year 2011. Ten discharge measurements were made during water year 2011 (Nos. 366 to No. 375). Measurements ranged from 15.2 cfs to 829 cfs. They cover the range in stage except for lower daily flows on Dec. 1-18, 2010 and the higher daily flows on: May 8-10, 16-18, 27-31, Jun. 1-8, 2011. The peak discharge of 1100 cfs occurred at 1145 on Jun 03, 2011 at gage height of 6.43 ft with a shift of +0.14 ft. It exceeded high measurement no. 372 made on May 26, 2011 by 0.45 ft in stage.
Discharge.--	Shifting section control method was used. Shifts were distributed by time from 0000 on Oct 1, 2010 to 1500 on Feb. 24, 2011 and from 1730 on Aug. 9, 2011 through the end of water year. During the rest of the year a variable stage-shift table was used. MUDBPRCO11vs1 was applied from 1515 Feb. 24, 2011 to 1715 on Aug. 9, 2011. Measurements showed shifts ranging from +0.01 to +0.13 ft. All measurements were given full weight and applied directly except measurements 370 and 373 which were discounted from -2% and 8% to smooth shift distribution. Measurement 371 was not used.
Special Computations.--	The ice estimated days employed using values from adjacent good days assuming that the gate settings remained constant.
Remarks.--	The record is good, except the period when ice on the control affected the stage discharge relationship. Record when ice affected the stage discharge relationship should be considered fair. Gage operated by Stephen Tuck and Jerry Thrush. Record developed by Jerry Thrush.
Recommendations.--	Levels should be run.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09131500 MUDDY CREEK BELOW PAONIA RESERVOIR

RATING TABLE.-- MUDBPRCO09A USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

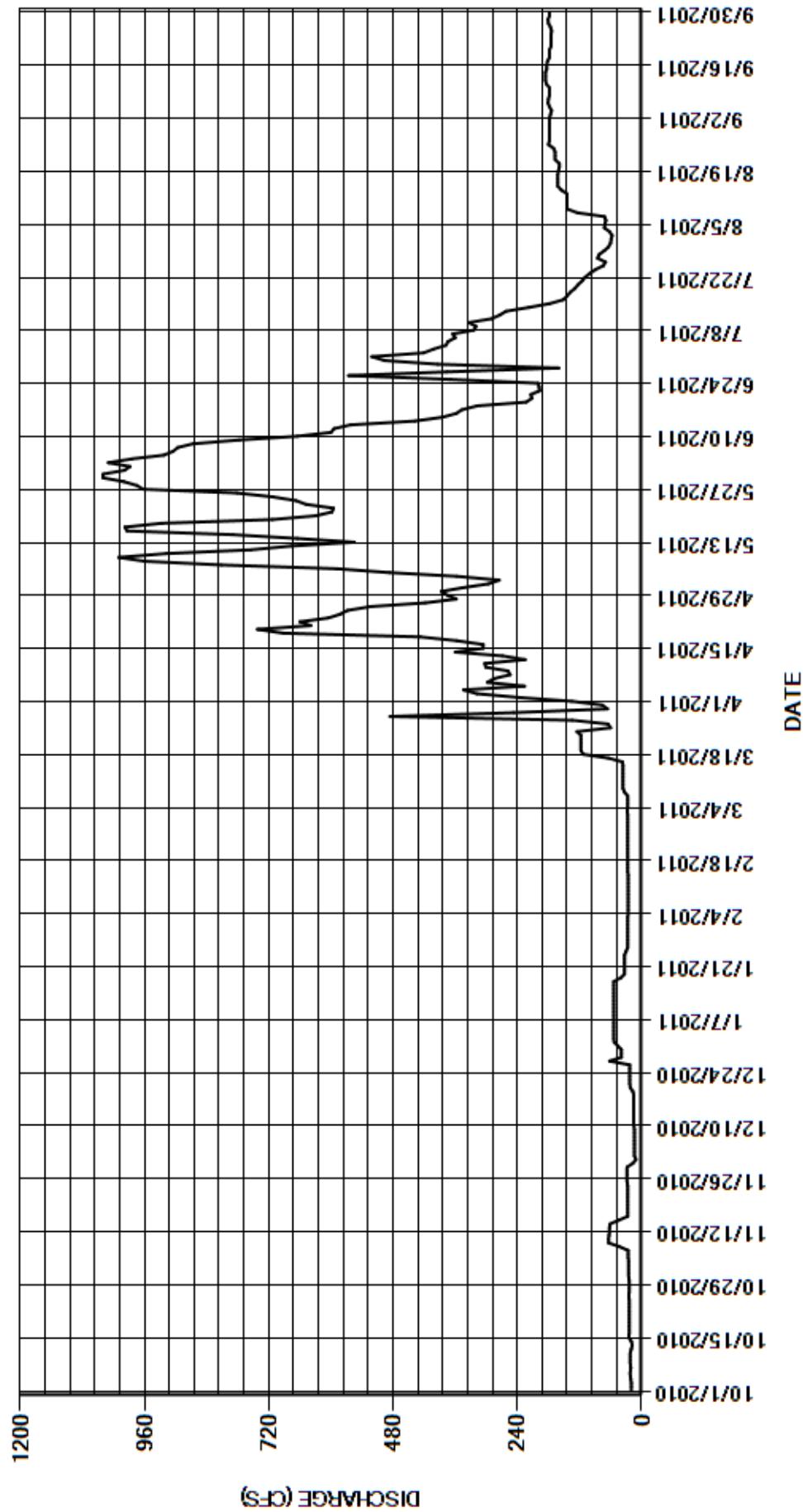
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	20	25	11	53	27	27	135	345	999	521	59	178
2	20	25	14	54	e27	27	235	296	988	421	57	178
3	20	25	14	54	e27	28	318	275	1030	402	62	176
4	21	25	14	54	e26	27	344	357	985	378	72	174
5	22	26	14	54	e26	27	226	487	923	374	71	178
6	22	26	14	54	26	27	298	588	905	360	69	181
7	21	26	14	54	26	27	285	812	896	365	72	180
8	22	43	14	54	26	33	254	961	866	324	124	178
9	22	64	14	54	26	36	258	1010	777	320	144	178
10	22	64	15	54	e26	36	301	918	665	334	144	178
11	22	63	15	54	26	36	303	755	600	290	144	184
12	20	62	15	54	26	36	225	677	594	274	144	186
13	18	62	15	54	26	36	269	555	562	262	144	186
14	20	61	15	54	26	36	360	665	438	218	155	186
15	25	44	15	54	27	36	306	790	385	178	162	183
16	24	27	15	54	27	37	306	994	358	152	162	183
17	24	27	15	54	27	64	357	998	347	144	162	182
18	24	27	15	40	27	113	427	927	318	138	162	178
19	24	27	17	33	e27	117	692	713	223	129	161	178
20	24	27	22	33	e27	117	742	629	212	123	159	178
21	24	27	23	33	27	117	639	598	214	115	159	175
22	24	27	23	33	27	117	660	595	197	109	167	175
23	24	27	23	33	27	117	605	648	198	100	167	175
24	24	27	23	33	27	125	582	668	200	89	167	175
25	24	28	23	30	27	60	568	713	369	74	170	174
26	25	28	23	27	27	65	524	782	566	70	180	176
27	24	28	62	27	27	134	418	963	376	85	178	180
28	24	28	39	27	27	486	358	975	160	82	178	181
29	24	28	39	27	---	247	375	1000	394	72	178	178
30	24	17	39	27	---	66	387	1040	497	64	178	178
31	25	---	46	27	---	76	---	1040	---	60	178	---
TOTAL	703	1041	660	1347	745	2533	11757	22774	16242	6627	4329	5370
MEAN	22.7	34.7	21.3	43.5	26.6	81.7	392	735	541	214	140	179
AC-FT	1390	2060	1310	2670	1480	5020	23320	45170	32220	13140	8590	10650
MAX	25	64	62	54	27	486	742	1040	1030	521	180	186
MIN	18	17	11	27	26	27	135	275	160	60	57	174
CAL YR	2010	TOTAL	46752	MEAN	128	MAX	1080	MIN	0.00	AC-FT	92730	
WTR YR	2011	TOTAL	74128	MEAN	203	MAX	1040	MIN	11	AC-FT	147000	

MAX DISCH: 1100 CFS AT 11:45 ON JUN 03,2011 GH 6.43 FT SHIFT 0.14 FT

MAX GH: 6.43 FT AT 11:45 ON JUN 03,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09131500 MUDDY CREEK BELOW PAONIA RESERVOIR
WY2011 HYDROGRAPH



GUNNISON RIVER BASIN

ABC LATERAL

Water Year 2011

Location.--	Lat. $38^{\circ}29'06''$, Long. $107^{\circ}44'59''$, in NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 27, T.49 N., R.8 W., Montrose County, on left bank of canal 270 ft. below takeout from South Canal, such takeout being 1700 ft. below the west portal of the Gunnison Tunnel.
Drainage Area and Period of Record.--	N/A. Published by the Colorado Division of Water Resources, Office of the State Engineer, since 1991.
Equipment.--	Sutron Satlink 2 HDR data collection platform with Stage Discharge Recorder (SDR) in a 36 in. diameter CMP shelter and a 24 in CMP stilling well. The SDR operates from a float and is set to an inside drop tape referenced to an adjustable RP on the instrument shelf. The control is a broad crested concrete structure about 12 feet below the gage. A wooden bridge at the gage is used to make flow measurements.
Hydrologic Conditions.--	The AB and C Drop aka the AB Lateral Canal combined with the South Canal account for the total diversion through the Gunnison Tunnel. Generally there is very little ice effect due to the warm properties of the water. At times snow will blow onto the control and this probably has some effect, but this is barely distinguishable on the GH trace and has been ignored. The AB Lateral is a man made structure and 100% controlled. The control is a concrete broad crested weir. Two gates are set below the control. One gate dumps into Cedar Creek; the other controls the AB Lateral through a concrete flume. At times these gates can cause the control to become 100% submerged.
Gage-Height Record.--	The primary record is 15-minute satellite data with SDR log, and DCP log as backup. The record is complete and reliable, except for two periods when the control was partly submerged from April 5-May 6, 2011 and from the drop on Jun 21, 2011 to the rise on Jul 22 due to the gates downstream being closed and causing water to backup into the control. The gage was visited on 12 separate occasions to verify the instrument remained calibrated to the primary reference. The SDR was adjusted 3 times (Oct 20, Nov 3, 2010 and Jun 7, 2011). The corrections ranged from -0.01 to 0.02 ft. SDR corrections were distributed by time between visits and measurements where appropriate. Moss was removed from the control on Feb. 28, 2011. The corrections were distributed by time through the record within the shift and datum distributions. This year there were 9 occurrences of short spikes, typically less than 3 hours in duration, during low flow conditions when the gates were closed or clogged with debris. These were on Oct. 28; Nov. 18; Dec. 1, 13, 2010; Feb. 23; Mar. 8, 10, 12-18; Apr. 5, 11, 2011. Unit values were edited to smooth discharge values.
Datum Corrections.--	Levels were last run on Aug. 15, 2006 using bench mark No. 1 (BM#1) as the base. No corrections were made as the RP and drop tape were found to be within the allowable tolerances.
Rating.--	The canal is concrete lined above and below the control section. The left side is a smooth trapezoidal shape. The right side is a smooth trapezoidal shape with a square step at the bottom. The concrete has been repaired in places and this has broken off in places. The control is a broad crested concrete structure about 12 ft. below the intakes. Rating ABCLATCO02 was used for the entire Water Year. The rating is well defined to 230 cfs. Ten discharge measurements (Nos. 320-329) were made this year ranging in discharge from 1.00 cfs to 131 cfs. These measurements cover the range in stage experienced except the lower flows seen Nov. 2, 3, 29, 30; Dec. 13,14, 2010; Jan. 10, 11, 24, 25; Feb. 21-23; Mar. 8-10, 2011, and the higher flows seen Aug. 07 to Sep. 16, 2011. The peak instantaneous flow of 138 cfs occurred at 1445 Aug. 2011 gage height of 3.19 ft with a shift of +0.07 ft. It exceeded Measurement No. 328, made Aug. 4, 2011 by 0.07 ft in stage.
Discharge.--	Shifting control method was used during all periods of record. Shifts were prorated by time from 0000 Oct. 1, 2010 to 2345 Oct. 9, 2010 and from 1100 Aug. 4, 2011 to the end of water year. During the remainder of the water year four variable stage-shift relationships were applied. ABCLATCO11VS1 (applied from 0000 Oct. 10, 2010 to 1530 Nov. 3, 2010) was used to define the period at the end of the irrigation season when the lateral was turned down to just before the control was cleaned. ABCLATCO11VS2 (applied from 1545 Nov. 10, 2010 to 1230 Jun. 7, 2011). ABCLATCO11VS3 (applied from 1245 Jun. 7, 2011 to 1030 Jul. 19, 2011). ABCLACO11VS4 (applied from 1045 Jul. 19, 2011 to 1045 Aug. 4, 2011). Measurements showed shifts varying between -0.03 and +0.07 feet. All were given full weight except No. 326 which was discounted -1% to smooth shift distribution.
Special Computations.--	The instrument correction on Oct. 20, 2010 was distributed by time from water year 2010 to the current water year using the DWR unit time proration method. The observation of the float frozen in the well on Feb. 4, 2011 has been ignored because the preceding and following periods indicate that the stilling well was functioning at steady state.
Remarks.--	The record is good, except for periods when the float may have been ice affected: Feb 2-6, 2011, and the two periods of partial submerged control conditions from Apr 5-May 6, 2011 and from the drop on Jun 21-Jul 22, 2011 which should be rated fair. Station maintained and record developed by Gerald M. Thrush.
Recommendations.--	A flush riser needs to be installed.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

ABC LATERAL

RATING TABLE-- ABCLATCO02 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

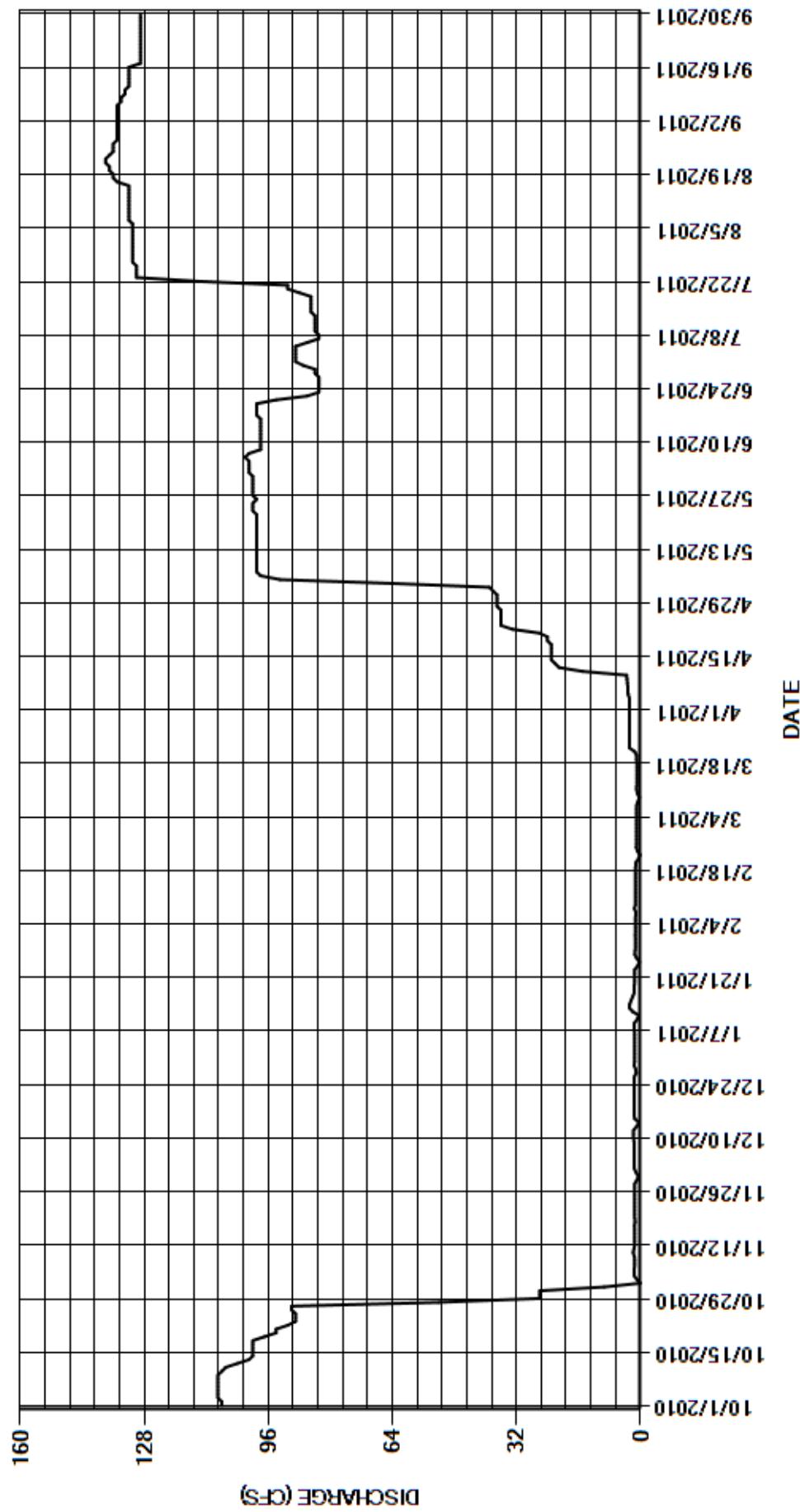
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	108	9.4	1.2	1.5	1.4	1.0	2.9	37	100	89	131	135
2	108	0.08	1.6	1.5	1.3	1.0	2.9	38	101	89	131	135
3	109	0.97	1.6	1.5	1.3	1.0	2.9	39	101	89	131	135
4	109	1.7	1.6	1.5	1.3	1.0	2.9	64	101	89	131	135
5	109	1.6	1.6	1.5	1.3	1.0	63.2	93	101	89	131	135
6	109	1.6	1.6	1.5	1.3	1.0	3.3	98	102	86	131	135
7	109	1.5	1.6	1.6	1.2	1.0	3.3	99	101	83	132	134
8	109	1.5	1.6	1.6	1.6	0.64	3.4	99	98	83	132	134
9	109	1.6	1.7	1.6	1.3	0.31	3.5	99	98	84	132	133
10	108	1.9	1.8	0.89	1.3	0.79	3.6	99	98	84	132	133
11	107	1.7	1.8	0.38	1.3	1.0	15	99	98	84	132	132
12	104	1.5	1.8	2.0	1.3	0.98	21	99	98	84	132	132
13	101	1.5	0.99	2.9	1.3	0.92	22	99	98	84	132	132
14	100	1.5	0.45	2.8	1.3	0.92	23	99	98	85	132	132
15	100	1.5	1.5	2.4	1.3	0.92	23	99	98	85	132	132
16	100	1.5	1.7	2.0	1.3	0.93	23	99	98	85	132	132
17	100	1.6	1.6	1.6	1.3	0.92	23	99	99	85	135	129
18	100	1.4	1.6	1.6	1.3	0.96	23	99	99	85	136	129
19	97	1.5	1.6	1.6	1.3	1.0	24	99	99	88	136	129
20	94	1.5	1.6	1.5	1.2	1.0	24	99	99	91	137	129
21	94	1.5	1.6	1.5	0.52	1.5	26	99	94	91	137	129
22	91	1.5	1.6	1.5	0.13	2.9	33	99	86	114	138	129
23	89	1.5	1.6	1.5	0.80	2.9	36	100	83	130	138	129
24	89	1.5	1.6	0.74	1.1	2.9	36	100	83	130	137	129
25	89	1.5	1.6	0.28	1.0	2.9	36	100	83	130	136	129
26	90	1.5	1.6	1.0	1.0	2.9	36	99	83	130	136	129
27	90	1.5	1.1	1.5	1.0	2.9	36	100	83	131	136	129
28	52	1.5	1.3	1.4	1.0	2.9	37	100	84	131	135	129
29	26	0.94	1.7	1.3	---	2.9	37	100	84	131	135	129
30	26	0.56	1.5	1.3	---	2.9	37	100	87	131	135	129
31	26	---	1.5	1.3	---	2.9	---	100	---	131	135	---
TOTAL	2852	50.55	47.24	46.79	32.75	48.79	602.9	2852	2835	3101	4148	3942
MEAN	92.0	1.68	1.52	1.51	1.17	1.57	20.1	92.0	94.5	100	134	131
AC-FT	5660	100	94	93	65	97	1200	5660	5620	6150	8230	7820
MAX	109	9.4	1.8	2.9	1.6	2.9	37	100	102	131	138	135
MIN	26	0.08	0.45	0.28	0.13	0.31	2.9	37	83	83	131	129
CAL YR	2010	TOTAL	19160.65	MEAN	52.5	MAX	113	MIN	0.08	AC-FT	38010	
WTR YR	2011	TOTAL	20559.02	MEAN	56.3	MAX	138	MIN	0.08	AC-FT	40780	

MAX DISCH: 138 CFS AT 14:45 ON AUG 21,2011 GH 3.19 FT SHIFT 0.07 FT

MAX GH: 3.19 FT AT 14:45 ON AUG 21,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ABC LATERAL
WY2011 HYDROGRAPH



GUNNISON RIVER BASIN
SOUTH CANAL NEAR MONTROSE
Water Year 2011

Location.--	Lat. 38°28' 58.3", Long. 107°45' 24.3", in SW 1/4 NE 1/4 sec 27, T.49 N., R.8 W., Montrose County, on right bank of canal approximately 3600 ft. below the west portal of the Gunnison Tunnel.
Drainage Area and Period of Record.--	N/A and published by the Colorado Division of Water Resources, Office of the State Engineer from October of 1990 to the present.
Equipment.--	Sutron Stage Discharge Recorder (SDR) connected to a Sutron Satlink 2 DCP in a 42-inch diameter CMP shelter and well. The primary reference is a steel drop tape referenced to an adjustable brass nut mounted on the wood instrument shelf. The SDR operates from a float. No changes this water year.
Hydrologic Conditions.--	A manmade structure which is a 100% controlled diversion. Winter and spring the natural gravel bar and two step concrete drop structure act as the main control for the gage. As late spring proceeds into summer and fall the willow / salt cedar along the banks and moss growth within the channel drown out the control. Large negative shifts occur as a result of the aquatic and terrestrial growth.
Gage-Height Record.--	The primary record is the 15-minute satellite data with SDR and DCP log data as backup. The record is complete and reliable, except the period 1545 Aug 24 to 0815 Oct 5, 2011, when the float tape wheel ratio and direction were inadvertently changed due to an SDR upgrade on Aug 24, 2011. This apparently reset the SDR configuration back to the default values of 18 inch wheel and clockwise counts up; the wrong way. This wasn't discovered and corrected till Oct 5 2011 when a major gate change tracked up instead of down. On Aug 29, 2011 an SDR correction of +0.03 ft was made at taped stage of 3.78. The +0.03 ft correction made on Aug 29 2011 was absorbed into the correction formulae described below, so it wasn't included with the instrument corrections. There are periods, just after the fall shut down and after the 9 winter runs when there is a small amount of water observed below the level of the inlets. These trailing off values are below the 5% threshold of the total mean winter values and have been ignored as minuscule bank storage. There were two SDR calibration corrections of 0.01 ft and -0.01 ft made on Mar 23 2011 and Jun 8 2011.
Datum Corrections.--	Levels were not run this water year. Levels were last run on Aug. 15, 2006, using BM No.1 as a base. BM 1, 2 and 3 were adjusted by -0.33 ft. due to the difference in the assumed RP elevation (21.00 ft.) and the actual tape length (20.67 ft). The RP elevation was set to the tape length. BM 2 was found to be reading 0.03 ft. high and was adjusted to an elevation of 11.504 ft. No corrections were made to gage heights, measurements or charts.
Rating.--	Control is a transition above a two step concrete drop structure. The low water control is natural gravel bar about 100 feet below the gage. Intermediate and high water control is the concrete transition structure located approximately 4,000 feet below the gage. Rating No. 16b dated November 1, 2008 was used from Oct 1, 2010 to December 31 2010. Rating 171 was used from January 1, 2011 through the end of Water Year 2011. Fourteen discharge measurements (Nos. 401 - 414) were made during the water year ranging in discharge from 97.8 to 984 cfs. Two observations of zero flow were also made: 1708 Nov 8, 2010 and 1500 Feb 28, 2011. Measurements and observations of zero flow cover the range in flow experienced. The peak flow of 984 cfs occurred at 0515 June 8, 2011 at a gage height of 3.34 ft with a shift of -0.05 ft. It did not exceed the maximum flow of measurement No. 409, made May 31, 2011. The highest recorded stage (3.85 ft. at 1030 on Oct. 5, 2010) exceeded the stage of measurements No. 413 and 414, made on Aug 29 and Sep 19 2011 by 0.07 ft. in stage.
Discharge.--	Shifting control method was used during all periods of record. Shifts were distributed by time from 1245 08/29/2011 to 1500 09/19/2011. Shifts were distributed using five variable stage-shift relationships during the rest of the Water Year: SOUCANCO11VS1, applied from 0000 10/01/2010 to 2345 12/31/2010 and associated with Rat 16b; SOUCANCO11VS2, applied from 0000 01/01/2011 to 0515 06/08/2011; SOUCANCO11VS3, applied from 0530 06/08/2011 to 1400 07/18/2011; SOUCANCO11VS4b, applied from 1415 07/18/2011 to 1230 08/29/2011; and SOUCANCO11VS5, applied from 1515 09/19/2011 to 1530 10/07/2011. Nine winter tunnel runs were made this water year. Measurements show unadjusted shifts varying from -0.92 ft to +0.10 ft. All were given full weight and applied directly except for measurement numbers 403-406, 409, 411 and 412 which were discounted from -3% to +5% to smooth shift distribution.
Special Computations.--	The largest value (1.5 cfs) estimated during the winter run recession flows is about 2% of the total run and have been assigned a value of 0.00 cfs. The convention used by loss studies associated with the Arkansas River Compact of breaking off releases / deliveries at 5% or even 8% is a supporting argument for this decision. The raw SDR data recorded during the period when the wheel size and direction were incorrect were corrected using the formula: [-0.66667x(Raw Value-Base Value)+Base Value]. The base values are known gage height readings at a specific date and time: 3.77 was used from 1545 Aug 24 to 1645 Aug 29; and 3.78 was used from 1700 Aug 29 to 0815 Oct 5. Raw values from the SDR were corrected in a spreadsheet and then imported.
Remarks.--	The record is good, except the period when the wheel ratio and reversal of the tape wheel took place from Aug 24, 2011 through the end of the Water Year, which is fair. Station maintained and record developed by Gerald M. Thrush.

Recommendations.--

The large gage pool makes the moss growth compound the negative shifts which are seen. The condition of a very large gage pool and a virtual channel control even without the aquatic growth makes the gage height much less sensitive to changes in the flow regimen. It is impractical to make any more frequent measurements, and even if it were there are instances when a particular stage or step / gate change isn't measured before another or next gate change takes place. We can only assume that the relationship between measurements is linear with a V Shift or when prorating by time. It has been suggested using an ADVM upstream. The site is concrete lined, is fairly close to the exit of the West Portal of the Gunnison Tunnel, has fairly high velocities which would minimize moss accumulation. The expense for the equipment and to relocate the gage would be high. The new site would need a bank operated cableway to use for conventional and ADCP measurements. These benefits would be far reaching. The time spent on frequent measurements to account for moss growth could be directed to other gages and projects. Confidence in the flow through the Gunnison Tunnel would be tremendously improved. The gage at the AB Lateral would still have to be operated.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

SOUTH CANAL NEAR MONTROSE

RATING TABLE-- SOUCANCO16b USED FROM 01-OCT-2010 TO 31-DEC-2010
SOUCANCO171 USED FROM 01-JAN-2011 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

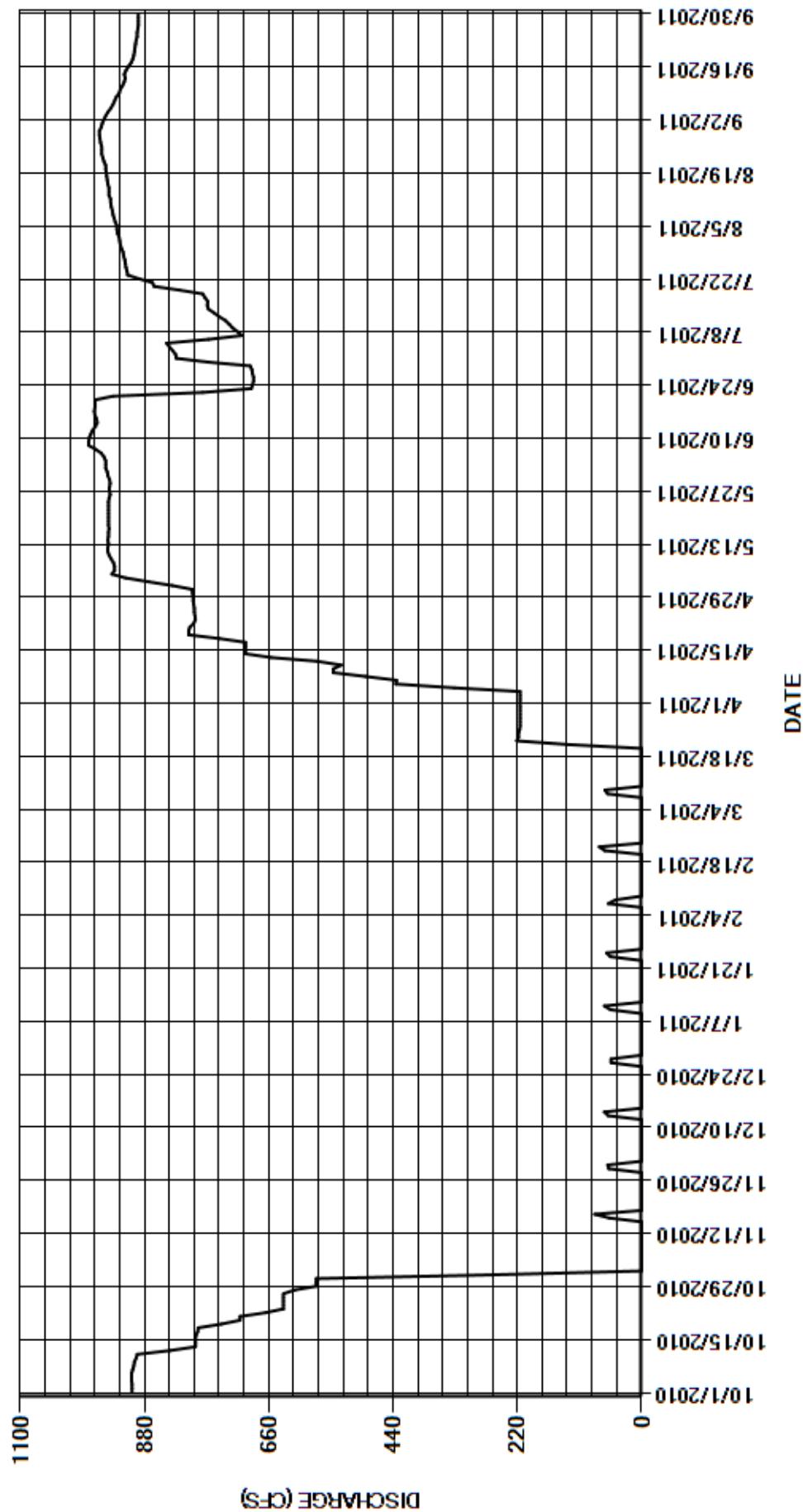
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	902	263	0.00	0.00	0.00	0.00	215	796	946	824	924	955
2	902	0.00	0.00	0.00	0.00	0.00	215	831	949	825	925	952
3	902	0.00	0.00	0.00	0.00	0.00	215	873	949	830	928	949
4	903	0.00	0.00	0.00	0.00	0.00	215	913	949	836	929	945
5	903	0.00	0.00	0.00	0.00	0.00	332	938	952	841	929	940
6	903	0.00	0.00	0.00	0.00	0.00	435	933	957	767	932	936
7	901	0.00	0.00	0.00	59	0.00	434	933	967	708	934	933
8	899	0.00	0.00	0.00	46	60	489	935	979	715	936	930
9	898	0.00	0.00	0.00	0.00	65	546	939	979	724	937	925
10	895	0.00	0.00	55	0.00	0.00	546	943	978	730	939	923
11	893	0.00	0.00	66	0.00	0.00	532	945	975	737	940	919
12	835	0.00	0.00	0.00	0.00	0.00	574	945	972	748	940	916
13	790	0.00	59	0.00	0.00	0.00	656	944	967	757	943	914
14	790	0.00	66	0.00	0.00	0.00	702	945	964	767	943	916
15	790	0.00	0.00	0.00	0.00	0.00	701	944	965	769	943	913
16	789	57	0.00	0.00	0.00	0.00	701	944	968	768	945	909
17	786	83	0.00	0.00	0.00	0.00	701	943	969	773	946	904
18	785	0.00	0.00	0.00	0.00	0.00	747	944	968	777	947	901
19	744	0.00	0.00	0.00	0.00	0.00	802	944	968	818	948	899
20	711	0.00	0.00	0.00	0.00	0.00	802	944	968	863	949	898
21	711	0.00	0.00	0.00	65	129	800	944	936	866	949	897
22	666	0.00	0.00	0.00	75	221	793	944	777	890	952	896
23	634	0.00	0.00	0.00	0.00	218	790	944	691	910	954	895
24	634	0.00	0.00	55	0.00	218	791	944	689	911	956	893
25	634	0.00	0.00	62	0.00	216	792	943	687	913	956	893
26	634	0.00	0.00	0.00	0.00	215	792	941	687	914	956	892
27	634	0.00	54	0.00	0.00	215	793	942	689	915	958	891
28	614	0.00	54	0.00	0.00	215	794	942	690	917	959	891
29	576	58	0.00	0.00	---	215	794	941	693	918	960	891
30	576	60	0.00	0.00	---	215	795	942	767	921	960	891
31	576	---	0.00	0.00	---	215	---	945	---	923	957	---
TOTAL	23810	521.00	233.00	238.00	245.00	2417.00	18494	28848	26595	25575	29274	27407
MEAN	768	17.4	7.52	7.68	8.75	78.0	616	931	886	825	944	914
AC-FT	47230	1030	462	472	486	4790	36680	57220	52750	50730	58060	54360
MAX	903	263	66	66	75	221	802	945	979	923	960	955
MIN	576	0.00	0.00	0.00	0.00	0.00	215	796	687	708	924	891

CAL YR	2010	TOTAL	183058.00	MEAN	502	MAX	998	MIN	0.00	AC-FT	363100
WTR YR	2011	TOTAL	183657.00	MEAN	503	MAX	979	MIN	0.00	AC-FT	364300

MAX DISCH: 984 CFS AT 05:15 ON JUN 08,2011 GH 3.34 FT SHIFT -0.05 FT
MAX GH: 3.85 FT AT 10:30 ON OCT 05,2010 (backwater from Moss / Aquatic growth)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SOUTH CANAL NEAR MONTROSE
WY2011 HYDROGRAPH



GUNNISON RIVER BASIN
UNCOMPAGRE RIVER UPSTREAM OF SOUTH CANAL
Water Year 2011

Location.--	Lat 38°21'29", Long 107° 47'32.5", in the SE ¼ NW ¼ of section 6, T.47 N., R.8 W, NMPM, Montrose County, Hydrologic Unit 14020006, on the left bank 1.98 mi. down-stream from the Uncompahgre River at Colona (a USGS stream gage) and about 5,000 feet up-stream of where the South Canal releases into the Uncompahgre River. It is 1.2 mi. down-stream of Beaton Creek, on private land, southeast of the end of Vernal Road.
Drainage Area and Period of Record.--	Approximately 476 square miles of drainage. Provisional electronic data May 18th, 2010 to September 30, 2010. Published October 1, 2010 to current year.
Equipment.--	Sutron SatLink Logger 2 with a Sutron Accubar Constant Flow Bubble Gage/Recorder in a 48" corrugated metal pipe bolted to a 6" thick concrete pad. The primary reference is a staff gage carried to the river and placed at the top of a nut (bench mark #1) bolted to a rock next to the streambed. The control is a large boulder drop structure approximately 30 feet downstream of the gage.
Hydrologic Conditions.--	The Uncompahgre River begins in high mountain terrain near Hurricane Peak at an elevation of 13,447 feet and drops to 6,220 feet at the gage. The gage is located approximately 8.5 miles downstream of Ridgway Reservoir. Warm water released from reservoir minimizes ice at the gage. The amount of flow at this gage is mainly comprised of water released from Ridgway Reservoir; however, there are several small tributaries and diversion structures between the reservoir and the gage.
Gage-Height Record.--	Primary record is 15-minute satellite data with 5-minute DCP log data used for backup purposes. Backup record is the 5 minute electronic data from the CFB. There were 4 fifteen minute values missing in the primary record on March 17, (2230-2315) that were filled in using the CFB log. Five instrument corrections were made to the CFB during water year 2011 and were distributed by time. These occurred as follows: -0.03 ft on October 7, 2010, -0.01 ft on Nov 19, 2010, +0.02 ft on Mar 18 2011, +0.05 ft on Apr 11 2011 and -0.07 ft on Sep 15 2011. The record is complete and reliable except for the following days when ice on the control affected the stage discharge relationship: Jan 2, 5 – 12, 15, 16, 23 –25, 27-30; and Feb 2 – 13, 2011.
Datum Corrections.--	Levels were not run this water year. The first set of levels run at this gage was on March 24, 2010. They were used to establish the elevation of the datum, BM No.1 and BM No.2. BM No. 1 is the top of a 3/8" nut attached to a large boulder 15 feet south east of the gage. BM No. 2 is the top of a "T" post near the parking lot.
Rating.--	The control is a large boulder drop structure approximately 30 feet downstream of the gage. Rating No. 01 dated June 07, 2010 was used for the entire water year. It is fairly well defined from 27 to 700 cfs. Flows above 700 cfs were estimated from the Uncompahgre at Colona gage (a USGS gage). Eight measurements were made during water year (Nos. 009-016). They range in discharge from 54.6 cfs to 207 cfs. They cover the range in stage experienced except for higher daily flows of Mar. 22-25, 27, 30, 31, Apr. 1-30, May 1-31, Jun. 1-30, Jul. 1-31, Aug. 1-31 and Sep. 1-7, 2011. The peak instantaneous flow of 1,080 cfs occurred at 0945 on July 10, 2011 at a gage height of 6.04 ft. with a shift of -0.16 ft. It exceeded the stage of Measurement No. 15, made Mar. 31, 2011 by 2.29 feet in stage.
Discharge.--	Shifting control method was used during all periods of record. Shifts were distributed by time and stage. Shifts were distributed by time from 1600 Sep 3 2010 to 1230 Dec 17 2010. Shifts were distributed by stage using variable stage-shift relationship (UNCUPSCOVS02) applied from 1245 Dec 17 2010 to 0945 Jul 10 2011. Shifts were distributed by time from 1000 Jul 10 2011 to the end of the water year. Measurements show unadjusted shifts varying from -0.34 ft. to -0.11 ft. All were given full weight and applied directly except for Measurement Nos. 12 and 16, which were discounted by 5% to 6% to smooth shift distributions. Measurement 13 was not used due to ice-affected the stage discharge relationship.
Special Computations.--	There is no bridge or cableway to make high flow measurements at this gage. Measurements above 400 cfs are not safe to wade. High flows are estimated using the USGS stream gage Uncompahgre at Colona located approximately 2 miles upstream. Evidence suggests that at some point during high water this spring a large rock in the controlling rock-drop structure was dislodged, thus affecting the stage discharge relationship. The PZF was measured to be approximately 1.20 in October of 2010 (see remarks in Meas. No. 009) but changed to approximately 0.09 in October of 2011 (see remarks in Meas. No. 017). Discharge for the days when ice affected the gage height record was estimated on the basis of partial days of good record, good gage data before and after ice affected data, water temperature data collected at the UNCCOLCO gage, Measurement No. 13 and comparing hydrographs from UNCUPSCO, UNCCOLCO and COWCRKCO.
Remarks.--	The record is rated fair, except for flows that exceed 700 cfs and the periods when ice affected the stage-discharge relationship are rated poor. Gage operated and maintained and record developed by Luke Reschke and Jerry Thrush.
Recommendations.--	Completion of the cantilever gage will improve the ease of determining the reference from the primary gage. The rating curve needs to be evaluated due to the suspected change in the control, and to take the HEC-RAS modeling into account for high-water.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

UNCOMPAHGRE RIVER UPSTREAM OF SOUTH CANAL

RATING TABLE.-- UNCUPSCO01 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

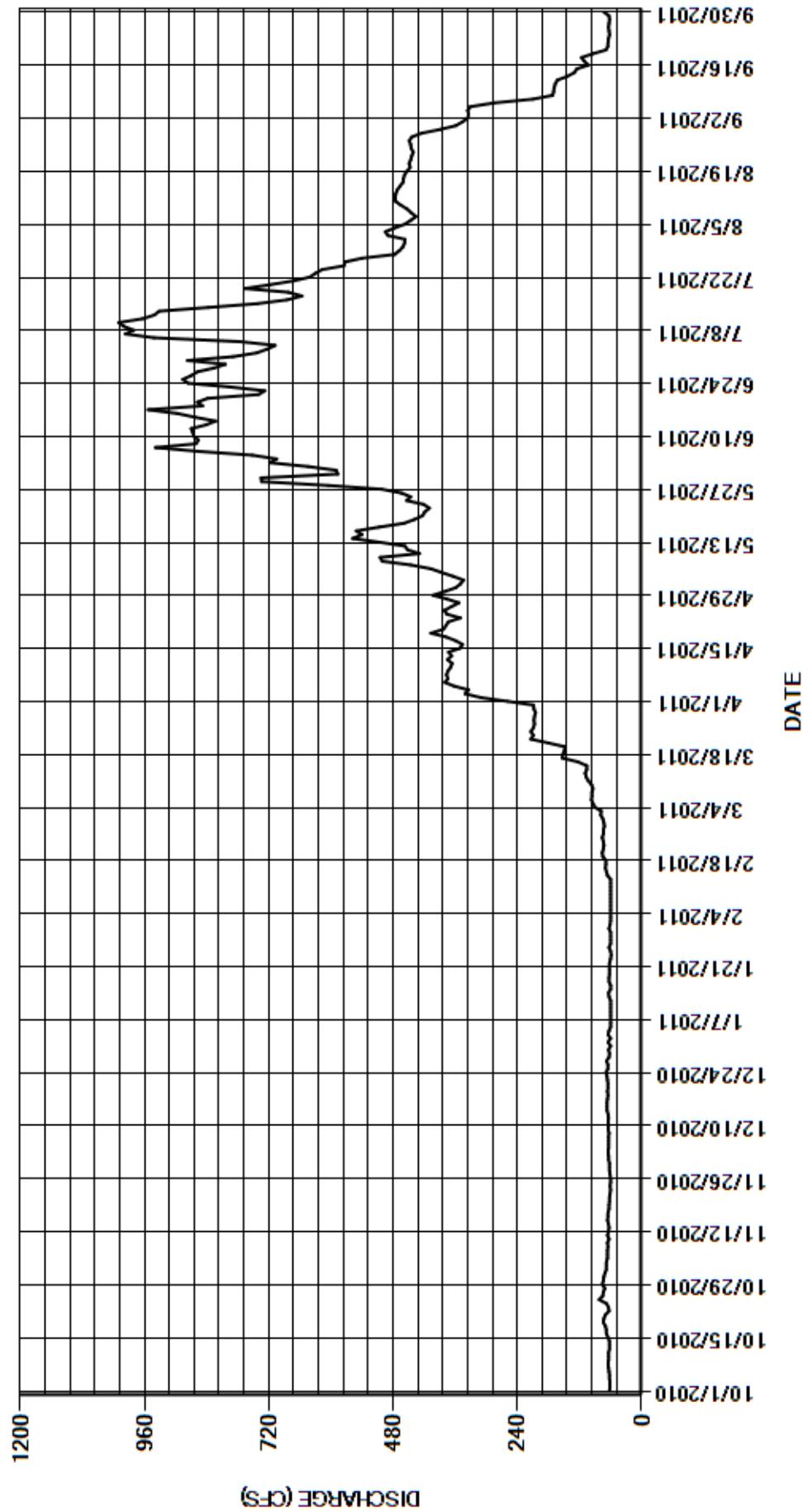
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	62	71	64	65	61	75	259	359	590	789	457	346
2	61	68	64	e60	e60	79	311	350	644	743	490	336
3	61	68	65	65	e60	78	341	344	718	723	495	334
4	62	68	64	63	e60	90	334	364	705	708	477	336
5	62	66	64	e60	e60	94	362	386	752	778	457	331
6	63	66	64	e60	e60	97	380	407	856	942	446	285
7	64	66	64	e60	e60	96	374	446	939	997	436	210
8	65	65	63	e60	e60	96	377	501	861	981	445	172
9	64	66	65	e60	e60	94	374	505	856	1000	453	170
10	64	63	64	e60	e60	97	369	429	865	1010	465	169
11	64	66	65	e60	e60	103	366	452	867	964	475	167
12	62	64	64	e60	e60	107	375	457	870	941	476	163
13	62	63	65	63	e60	109	367	506	841	932	475	144
14	62	64	67	64	66	106	373	558	823	837	472	130
15	65	66	67	e60	68	106	351	540	862	742	467	125
16	68	65	67	e60	70	123	346	551	897	685	461	103
17	68	65	66	63	69	153	359	507	953	656	460	111
18	70	63	65	63	69	152	378	459	848	682	458	116
19	74	63	66	62	75	149	407	439	858	766	453	94
20	73	62	65	62	76	148	383	423	838	718	447	69
21	70	62	65	62	74	180	378	419	740	673	449	65
22	63	61	66	62	73	214	373	410	728	641	446	65
23	64	60	67	e60	74	209	350	421	795	630	444	64
24	68	61	69	e59	76	214	376	454	876	617	441	62
25	82	60	65	e60	74	209	381	446	886	575	445	63
26	75	60	65	63	74	207	367	464	870	573	446	64
27	74	61	68	e60	72	208	353	502	858	540	449	63
28	71	62	63	e60	73	207	376	605	826	477	444	62
29	76	62	62	e60	---	205	403	734	804	468	425	63
30	74	62	64	e60	---	208	380	735	877	461	389	73
31	73	---	60	63	---	209	---	587	---	458	359	---
TOTAL	2086	1919	2012	1899	1864	4422	10923	14760	24703	22707	14002	4555
MEAN	67.3	64.0	64.9	61.3	66.6	143	364	476	823	732	452	152
AC-FT	4140	3810	3990	3770	3700	8770	21670	29280	49000	45040	27770	9030
MAX	82	71	69	65	76	214	407	735	953	1010	495	346
MIN	61	60	60	59	60	75	259	344	590	458	359	62
CAL YR	2010	TOTAL	6017	MEAN	65.4	MAX	82	MIN	60	AC-FT	11930	
WTR YR	2011	TOTAL	105852	MEAN	290	MAX	1010	MIN	59	AC-FT	210000	

MAX DISCH: 1080 CFS AT 09:45 ON JUL 10,2011 GH 6.04 FT SHIFT -0.16 FT

MAX GH: 6.04 FT AT 09:45 ON JUL 10,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

UNCOMPAHGRE RIVER UPSTREAM OF SOUTH CANAL
WY2011 HYDROGRAPH



GUNNISON RIVER BASIN
UNCOMPAHGRE RIVER AT UNCOMPAHGRE ROAD BRIDGE
Water Year 2011

Location.--	Lat. 38°22'40.6"; Long. 107°48'36.5', in the NE¼ NW¼ of section 36, T. 48 N, R. 9 W., NMPM, Montrose County, CO, Hydrologic Unit 14020006, on the right bank on the downstream side of the Uncompahgre Road Bridge, approximately 4,000 ft. downstream of confluence with the South Canal and 7.8 mi. south of Montrose.
Drainage Area and Period of Record.--	Approximately 480 square miles of drainage. Published May 25, 2011 to current year.
Equipment.--	A Campbell Scientific Radar Water-Level Sensor gage (model CS476-L) mounted on the downstream side of the bridge, near the left bank. The DCP is a Sutron SatLink Logger 2 mounted in a 24" X 18" X 10" (approximately) NEMA box, bolted to a welded steel bracket, which is bolted to two I-beams on the down-stream, right bank wing-wall of the bridge. The primary reference is a wire-weight gage mounted on the downstream side of the bridge, near the radar unit.
Hydrologic Conditions.--	The control is a cobble riffle approximately 150 feet downstream of the gage. The flows at this gage primarily consist of water released from Ridgway Reservoir and trans-basin water from the Gunnison Tunnel through the South Canal. There are several small tributaries and diversions between the reservoir and the gage.
Gage-Height Record.--	Primary record is 15-minute radar data downloaded from satellite telemetry with DCP download data for backup purposes. The gage was visited on 8 separate occasions to verify the instruments remained calibrated to the primary reference gage. There were 12 fifteen minute values missing in the primary record on July 14th, (1930-2215) that were filled in using the data downloaded from the DCP. One instrument correction was made to the radar sensor during 2011 and it was distributed by time. The instrument correction was -0.10 ft made on 6/22/11 at 1540. This is a new gage started in operation on May 25, 2011. Record is complete and reliable for the period of operation: May 25-Sep 30 2011 this water year.
Datum Corrections.--	Levels were run on Apr 27 2011. This is the first set of levels at this gage and they were used to establish the elevation of the datum and the relative elevations of BM No.1 and BM No.2, as well as the elevation of the check bar in the wire-weight gage.
Rating.--	The control is a cobble riffle located approximately 150-ft. downstream of the gage. Rating 02 dated July 28, 2011, in use from May 25, 2011 and used for the entire period of record. Before high water the control was split into two separate channels by a small island. There was water in both channels during the first few measurements. However, as of the most recent measurement (Nov 10 2011) the left channel was completely dry. It is estimated that that channel went dry at about gage height 3.20 ft. Further observations and measurements will need to be made to quantify the effect of this change in the control. Six discharge measurements (Nos. 1-6) were made during the water year ranging in discharge from 68.4 to 1750 cfs. Measurements cover the range in stage experienced except for the higher average daily flows of June 6, 7, 11-17, 19, 20, 2011. The instantaneous peak flow of 2,460 cfs occurred at 0130 on June 7, 2011 at a gage height of 5.52 ft. and a shift of 0.00 ft. It exceeded the stage of measurement no. 5 made on June 9, 2011 by 0.47 feet.
Discharge.--	A shifting control method was used for the entire water year. Shifts were applied as defined by measurements and distributed by stage. Shifts were distributed by stage using variable shift curve UNCBRGCO02VS01 from start of record on May 25, 2011 until the end of the water year. Variable shift curve was defined by Measurements 5-7. Open water measurements showed shifts varying between -0.03 to 0.10 ft. Shifts were applied directly and given full weight except for Measurement No. 3 which was discounted 8% to smooth shift distribution. Measurement 4 was not used due to very poor data collection by the ADCP (due to conditions on the stream).
Special Computations.--	None.
Remarks.--	This is a new gage with record starting on May 25 2011. The partial year record is fair due to lack of rating definition of the new rating. Station maintained by Gerald M. Thrush and Luke Reschke.
Recommendations.--	The effect of the change in the control needs to be determined. Also, confirmation of the rating would be accomplished by completion of the HEC-RAS modeling.

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UNCOMPAHGRE RIVER AT UNCOMPAHGRE ROAD BRIDGE

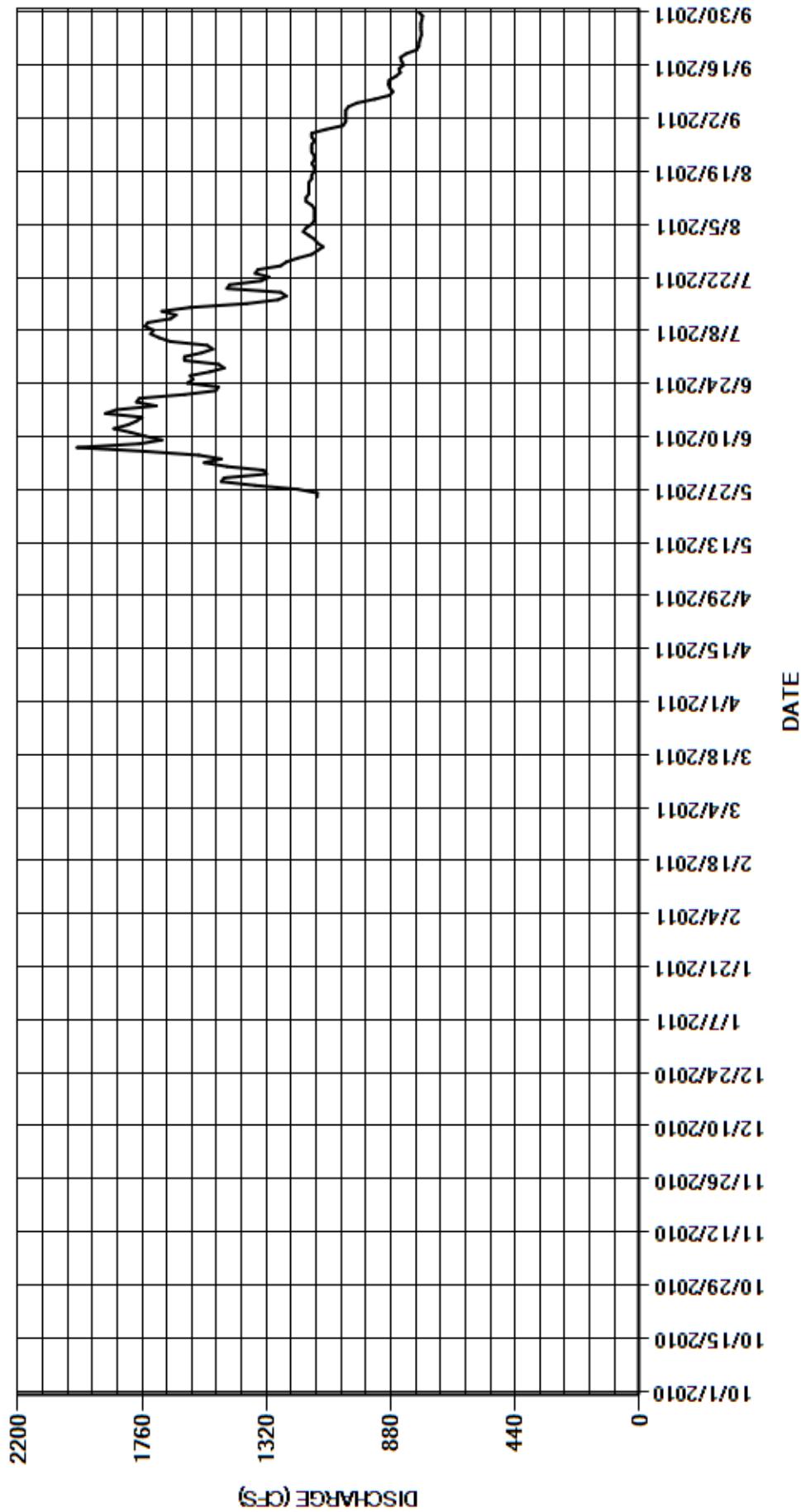
RATING TABLE.-- UNCBRGCO2 USED FROM 01-MAY-2011 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011												
DAY	MEAN VALUES											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	---	---	1330	1610	1150	1040
2	---	---	---	---	---	---	---	---	1460	1550	1170	1040
3	---	---	---	---	---	---	---	---	1540	1510	1190	1040
4	---	---	---	---	---	---	---	---	1480	1530	1180	1040
5	---	---	---	---	---	---	---	---	1560	1660	1160	1030
6	---	---	---	---	---	---	---	---	1750	1700	1150	1000
7	---	---	---	---	---	---	---	---	1990	1730	1150	937
8	---	---	---	---	---	---	---	---	1770	1720	1150	884
9	---	---	---	---	---	---	---	---	1690	1750	1150	873
10	---	---	---	---	---	---	---	---	1750	1740	1160	884
11	---	---	---	---	---	---	---	---	1800	1660	1180	889
12	---	---	---	---	---	---	---	---	1860	1640	1180	886
13	---	---	---	---	---	---	---	---	1810	1690	1170	863
14	---	---	---	---	---	---	---	---	1780	1590	1170	847
15	---	---	---	---	---	---	---	---	1760	1390	1170	851
16	---	---	---	---	---	---	---	---	1890	1280	1170	835
17	---	---	---	---	---	---	---	---	1850	1250	1160	842
18	---	---	---	---	---	---	---	---	1710	1270	1160	846
19	---	---	---	---	---	---	---	---	1780	1460	1150	826
20	---	---	---	---	---	---	---	---	1770	1450	1150	789
21	---	---	---	---	---	---	---	---	1610	1340	1160	781
22	---	---	---	---	---	---	---	---	1500	1310	1150	780
23	---	---	---	---	---	---	---	---	1490	1360	1150	776
24	---	---	---	---	---	---	---	---	1600	1350	1160	772
25	---	---	---	---	---	---	---	1140	1580	1270	1160	773
26	---	---	---	---	---	---	---	1140	1590	1250	1160	774
27	---	---	---	---	---	---	---	1210	1520	1210	1150	774
28	---	---	---	---	---	---	---	1360	1470	1160	1160	770
29	---	---	---	---	---	---	---	1480	1490	1140	1160	768
30	---	---	---	---	---	---	---	1470	1610	1120	1110	782
31	---	---	---	---	---	---	---	1320	---	1140	1050	---
TOTAL	---	---	---	---	---	---	---	9120	49790	44830	35840	25992
MEAN	---	---	---	---	---	---	---	1303	1660	1446	1156	866
AC-FT	---	---	---	---	---	---	---	18090	98760	88920	71090	51560
MAX	---	---	---	---	---	---	---	1480	1990	1750	1190	1040
MIN	---	---	---	---	---	---	---	1140	1330	1120	1050	768

CAL YR	2010	TOTAL	MEAN	MAX	MIN	AC-FT	(PARTIAL YEAR RECORD)	
WTR YR	2011	TOTAL	165572	1284	MAX	768	AC-FT	328400 (PARTIAL YEAR RECORD)
MAX DISCH:	2460 CFS	AT 01:30 ON JUN 07,2011	GH 5.52 FT SHIFT 0 FT					
MAX GH:	5.52 FT	AT 01:30 ON JUN 07,2011						

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

UNCOMPAHGRE RIVER AT UNCOMPAHGRE ROAD BRIDGE
WY2011 HYDROGRAPH



GUNNISON RIVER BASIN
UNCOMPAGRE RIVER NEAR OLATHE
Water Year 2011

Location.--	Lat. 38°36'05", Long. 107°58'58", SW $\frac{1}{4}$ SW $\frac{1}{4}$ of NW $\frac{1}{4}$ sec. 15, T.50 N., R. 10W, NMPM, and about 3,100 ft. above the S. H. 348 bridge and about 5,100 ft below the East Canal headgate and diversion structure, both stream distance. The gage is on the right bank and in Montrose County.
Drainage Area and Period of Record.--	Approximately 817 square miles or 522,880 acres in the drainage area from a project and calculations supplied from Division VII. Published by the Colorado Division of Water Resources, Office of the State Engineer since 1993.
Equipment.--	A Sutron SatLink Logger 2 with a stage discharge recorder (SDR) in a 48-in spiral corrugated metal shelter and stilling well. The SDR is activated by a float in the stilling well. The primary reference gage is a steel drop tape referenced to an adjustable RP located in the gage on the instrument shelf. No changes this water year.
Hydrologic Conditions.--	The control is the natural streambed with a somewhat stable cobble channel. There is very little ice in winter as the releases from Ridgway Reservoir and the geothermal water from the upper Uncompahgre River in the Ouray area, help to keep the River at this point virtually free of ice. The Uncompahgre River is controlled by releases from Ridgway Reservoir and imported water through the Gunnison Tunnel during periods of low flow. The canals of the Uncompahgre Project affect the amount of discharge at this gage. The East Canal is immediately upstream, and the Ironstone Canal is above that. The automatic gates on the Ironstone cause the gage height to be very uneven as the gates seek their set level. Moss growth at low flows can change the control in just a few days.
Gage-Height Record.--	The primary record is the 15 minute electronic data from the Sutron Satlink 2 with the SDR logger as backup for missing transmitted data. This record is complete and reliable. The float tape slipped off the SDR pulley wheel during the period 0830 Nov 2 (a sharp GH rise) to 1300 Nov 4 when it was discovered and corrected. The stage-discharge relationship was affected by ice on Nov 25, 26, 2010; Jan 1-6, 10-13, Feb 5, 11-12, 2011. Two minor shaft encoder corrections of -0.02 ft and +0.02 ft resulting from calibration of the SDR to the inside drop tape were distributed by time. No flush correction were observed.
Datum Corrections.--	Levels were not run this water year. Levels were last run on August 29, 2007, using BM No. 1 as base.
Rating.--	The control is a natural cobble channel. Rating UNCOLACO8 was developed and put into use February 14, 2010. The highest measurement at that time in the range of 1200 cfs was used to help better define the higher range of the rating. The mid range is similar to previous ratings, 8A and 8B. Discharge Measurements Nos. 241-249 were made during water year 2011. Measurements ranged from 1.39 cfs to 796 cfs, which covered the range of all the flows seen, except the lower flows of May 1-2, 2011, and the higher flow of Jun 17, 2011. The instantaneous peak flow of 1140 cfs occurred at 1515 Jun 17, 2011, at a gage height of 5.48 ft with a shift of -0.07 ft. The peak exceeded the stage of the high measurement No. 247 made Jun 10, 2011 by 0.69 ft.
Discharge.--	A shifting control method was used. Shifts were distributed by time from 1415 Dec 13, 2010 to 1545 Mar 31, 2011, and from 1545 Sep 15, 2011 through the end of Water Year 2011. Shifts were distributed by stage using four variable stage-shift relationships: UNCOLACOvs111, based on Msmts 240-242 (applied from 0000 Oct 1, 2010 to 1400 Dec 13, 2010); UNCOLACOvs112, based on Msmts 245A, 245B and 246 (applied from 1600 Mar 31, 2011 to 1430 May 2, 2011); UNCOLACOvs113, based on Msmts 246 and 247 (applied from 1445 May 2, 2011 to 1015 Jun 10, 2011), and, UNCOLACOvs114, based on Msmts 247-249 (applied from 1030 Jun 10, 2011 to 1530 Sep 15, 2011). Measurements made in water year 2011 showed a range in computed shifts from -0.38 ft to 0.00 ft. All measurements were given full weight and applied directly except Nos. 242 and 249, which were discounted from -1.72% to 1.73% for smoothing purposes.
Special Computations.--	Discharge for periods when the stage-discharge relation was affected by ice were estimated using good adjacent days and comparing the pattern on the electronically generated chart. Evaluation also included high and low temperature data obtained from the Montrose 2 weather station about 10 miles away.
	ADCP measurement No. 245 consisted of 8 transects and was made during a period of GH variation caused by the upstream automatic Ironstone Canal gate. It was assumed that the lower flow transects were associated with lower recorded gage heights and the higher flow transects were associated with the higher recorded gage heights. This trend was evident in the transect measurement times and the recorded GH times but was not entirely consistent. The stage was changing rapidly and the stilling well didn't have time to respond to the outside conditions. The result was a zero shift for both the low and high measured transects and associated mean gage heights. Msmts 245A and B have been rated fair as a result.
Remarks.--	The record is rated good, except periods when the stage-discharge relation was affected by ice, which are estimated and poor, and when the tape slipped on the SDR wheel which is rated fair. Station maintained by Luke Reschke and Gerald Thrush and the record has been developed by Gerald M. Thrush.
Recommendations.--	The installation of an outside gage would help determine if and when there was drawdown. The rating curve needs to be evaluated at the lower end; there appears to have been fill in the low water control. Meter notes need to note more detail about control / moss conditions. Levels need to be run in WY12.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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UNCOMPAHGRE RIVER NEAR OLATHE

RATING TABLE.-- UNCOLACO8 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

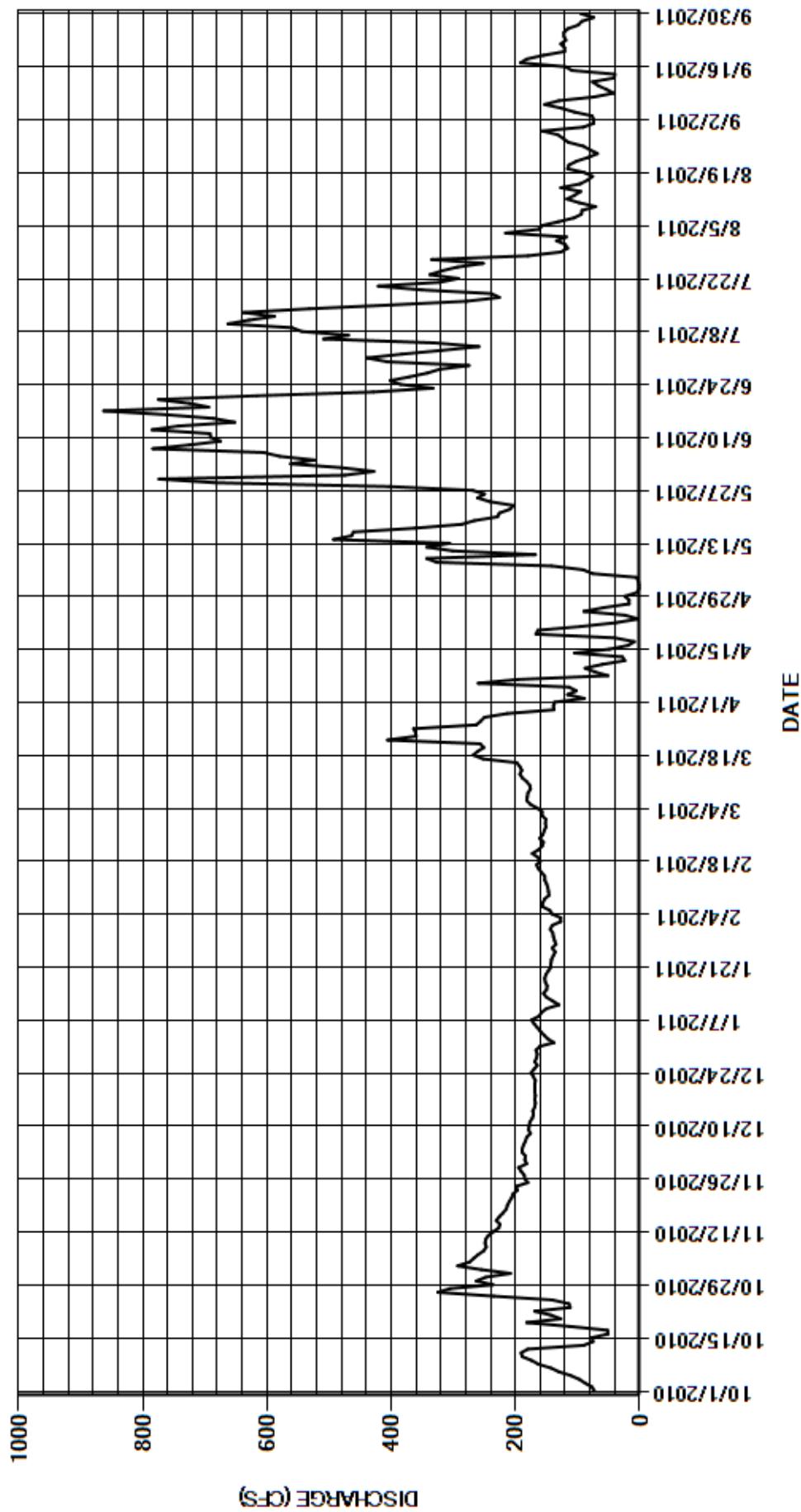
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	73	208	185	e138	141	151	137	1.3	428	439	134	74
2	77	255	184	e148	127	157	89	1.3	480	383	118	74
3	88	293	189	e154	127	157	116	2.2	562	319	216	77
4	97	274	189	e160	141	165	102	5.3	524	259	162	105
5	111	267	187	e165	e145	176	114	76	580	332	157	126
6	130	260	184	e170	157	182	260	91	605	509	131	153
7	143	251	182	174	156	181	197	142	784	469	106	130
8	163	247	176	162	153	180	51	327	725	544	94	73
9	174	249	179	158	146	176	72	343	675	560	93	42
10	189	248	178	e150	147	177	88	168	691	663	71	54
11	191	244	177	e130	e148	182	60	301	692	629	97	67
12	180	236	173	e140	e150	189	24	343	785	588	117	76
13	90	227	171	e150	153	193	28	306	743	638	105	41
14	75	225	172	155	153	190	105	493	652	532	95	40
15	77	231	169	150	158	193	49	464	686	400	127	109
16	51	226	168	149	163	198	19	461	762	278	96	120
17	52	220	169	152	166	252	8.6	362	863	226	84	192
18	113	215	168	153	160	268	40	287	694	239	76	182
19	182	213	169	151	164	261	167	266	725	351	89	155
20	127	210	169	147	173	251	164	229	775	421	116	121
21	143	206	169	143	163	257	95	226	617	322	114	121
22	169	204	168	143	157	406	39	209	429	292	102	127
23	112	197	171	142	155	360	2.4	203	333	338	83	119
24	114	199	175	139	161	361	24	241	385	319	68	122
25	141	e180	170	136	156	364	90	261	402	294	80	122
26	235	e185	165	141	154	263	58	250	371	252	91	116
27	325	186	169	135	151	256	17	269	342	335	115	99
28	305	191	166	137	152	250	17	403	322	180	123	93
29	236	195	165	139	---	213	24	682	275	127	132	74
30	263	182	167	140	---	138	4.2	774	407	116	157	95
31	248	---	161	144	---	139	---	475	---	120	91	---
TOTAL	4674	6724	5384	4595	4277	6886	2261.2	8662.1	17314	11474	3440	3099
MEAN	151	224	174	148	153	222	75.4	279	577	370	111	103
AC-FT	9270	13340	10680	9110	8480	13660	4490	17180	34340	22760	6820	6150
MAX	325	293	189	174	173	406	260	774	863	663	216	192
MIN	51	180	161	130	127	138	2.4	1.3	275	116	68	40
CAL YR	2010	TOTAL	60861.6	MEAN	167	MAX	1110	MIN	5.3	AC-FT	120700	
WTR YR	2011	TOTAL	78790.3	MEAN	216	MAX	863	MIN	1.3	AC-FT	156300	

MAX DISCH: 1140 CFS AT 15:15 ON JUN 17,2011 GH 5.48 FT SHIFT -0.07 FT

MAX GH: 5.48 FT AT 15:15 ON JUN 17,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

UNCOMPAHGRE RIVER NEAR OLATHE
WY2011 HYDROGRAPH



GUNNISON RIVER BASIN
REDLANDS CANAL NEAR GRAND JUNCTION
Water Year 2011

Location.--	Lat. 39°02'52.93", Long. 108°34'33.16", in the NE $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ Sec 27, T1S, R1W, Ute Meridian, Mesa County, Hydrologic Unit 14020005, on the right bank just downstream of and attached to an old bridge.
Drainage Area and Period of Record.--	N/A. Published streamflow record by the Colorado Division of Water Resources, Office of the State Engineer since 1991.
Equipment.--	A Sutron SatLink 2 DCP, Acoustic Doppler Velocity Meter (ADVM) in a cooperative agreement with the USBR and a Sutron Constant Flow Bubbler set to an outside staff gage. The Channel Master (CM) ADVM has the ability to give instantaneous flow readings. It produces the primary discharge record. The Channel Master and AccuBubble are connected to the DCP via SDI-12 with a terminal block. The following data is transmitted to the GOES satellite: GAGE_HT (CFB), DISCHRG2 (ADVM), and GAGE_HT2 [ADVM Vertical Beam (VB)]. The DWR web page reports DISCHARG which is calculated from a conventional rating table. This value is less accurate than the onsite flow data because there is no stage-discharge relationship. In absence of ADVM, discharge is estimated using the stage-discharge relationship from the bubbler.
Hydrologic Conditions.--	The Redlands Canal is a channel carved into the sandstone cliffs with a hard sedimentary bed rock bottom. The channel bottom is relatively flat with vertical walls along the side. Water in the canal is for power generation and irrigation. Penstock gates at the Redlands Water and Power Canal Company downstream of the gage control the flow in the canal and thus there is no unique stage-discharge relationship.
Gage-Height Record.--	ADVM COMPUTED RECORD: Discharge calculated from data provided by the ADVM was used from Oct. 1, 2010 to Sept. 30, 2011. The record is complete and reliable except for the period when the CM locked up, ice affected the CM sensor and the CM collected spurious values. The CM locked up Nov. 10-12, 2010. Ice affected the CM readings from Jan. 8-18, 2011. Spurious values from the CM were observed in the record on May 9; Jul. 11, 13, 20, 26, 28, 2011.
Datum Corrections.--	Levels were not run during Water Year 2011. New bench marks were established and staff gages set at this site on Mar. 24, 2005. Levels were last run on March 24, 2006 by the USBR in cooperation with the development of the index velocity rating for the CM.
Rating.--	<p>Index Velocity: The original index velocity was developed in water year 2006, from measurements 292-295, and loaded into the Channel Master ADVM. This index velocity was considered good from a range in stage of 6.00 ft to bank full stage somewhere above 7.82 ft. The original index velocity coefficient was 0.815. A new index velocity coefficient (0.877) was developed from measurements (315, 317, 318, 319 and 320) made last water year. The new index velocity coefficient was entered into the Channel Master on Nov. 12, 2010 but was inadvertently entered as 0.900.</p> <p>A correction factor of 1.076 ($0.877/0.815 = 1.076$) was applied to the Channel Master data to correct the in situ data logged in the Channel Master from Oct 01, 2010 to Nov 12, 2010. Another correction factor of 0.97 was applied to the data from Nov. 12, 2010 to the end of the water year to correct the incorrect index velocity coefficient entered into the Channel Master software ($0.90*0.97 = 0.87$).</p> <p>Eight measurements (No. 320-327) were made during the water year. They range in discharge from 760 cfs to 956 cfs. An observation of zero flow was made on Mar. 22, 2011. Measurements and observations of zero flow cover the range in discharge except for the higher flows of Jun. 24, 25, 29, 30; Jul. 1, 5, 6, 9, 2011. The peak instantaneous flow of 1,020 occurred at 1515 Jul. 6, 2011. The peak instantaneous gage height was 7.77 ft. occurred at 2200 May 9, 2011.</p>
Discharge.--	The Channel Master ADVM on site computed flow was used whenever it was available. This year's record has been developed from the computed flow from the ADVM. Stage-discharge values using the CFB and shifts derived from measurements were not used.
Special Computations.--	

A new index velocity was developed in water year 2010 from 5 different discharge measurements (no. 315, 317, 318, 319 and 320). The DCP was set to log discharge values every 5 minutes from the Channel Master. The raw 5 minute discharge values were generated from averaging discharge sampled over a 50 second period from the Channel Master. The average discharge from each measurement was divided by the raw average discharge from the Channel Master (collected over the same period) to develop an index velocity coefficient for each measurement. The index velocity coefficient for each measurement was averaged to develop the new index velocity coefficient (0.877) implemented in water year 2011.

The original index velocity coefficient programmed into the software of the Channel Master was 0.815. The original index velocity coefficient was updated to 0.877 on Nov. 12, 2010. Subsequently data logged in the DCP from Oct. 1, 2010 to Nov. 12, 2010 was based on the original index velocity coefficient. By applying the reciprocal of the original index velocity coefficient ($1.227 = 1/0.815$) to the data logged in the DCP, a raw data set can be developed. The raw data set multiplied by the new index velocity coefficient (0.877) determined the final discharge values.

When ice forms along the edge of the channel, the vertical beam from the Channel Master will under register depth. This in turn causes flows reported by the Channel Master to be low as the area calculation is low. Since the width of the canal remains relatively constant as the banks are nearly vertical, it can be said that area is directly proportional to the depth of water. Gage height values from the CFB appear to be valid as ice along the banks does not cause backwater. Therefore dividing the gage height of the CFB by the gage height of the vertical beam, an ice correction factor can be determined. The ice correction factor multiplied by the flow reported by the Channel Master provides the basis for estimating ice affected flow.

The days when the Channel Master locked up, and collected spurious values were estimated using adjacent good values. The spurious values have been seen before, and are probably caused by heavy clay / silt laden colloidal suspension mixture / suspensions.

Remarks--

The record is rated good, except for the period when CM locked up, ice affected the CM sensor and the CM collected spurious values. Record when the CM locked up and ice affected the CM sensor should be considered poor. Record when the CM collected spurious values should be considered fair. Station maintained and record developed by Gerald M. Thrush .

Recommendations--

The data needs to be downloaded on a more frequent schedule because the number of logged parameters has increased and they are being logged on a 5 minute interval.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

REDLANDS CANAL NEAR GRAND JUNCTION

RATING TABLE--

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

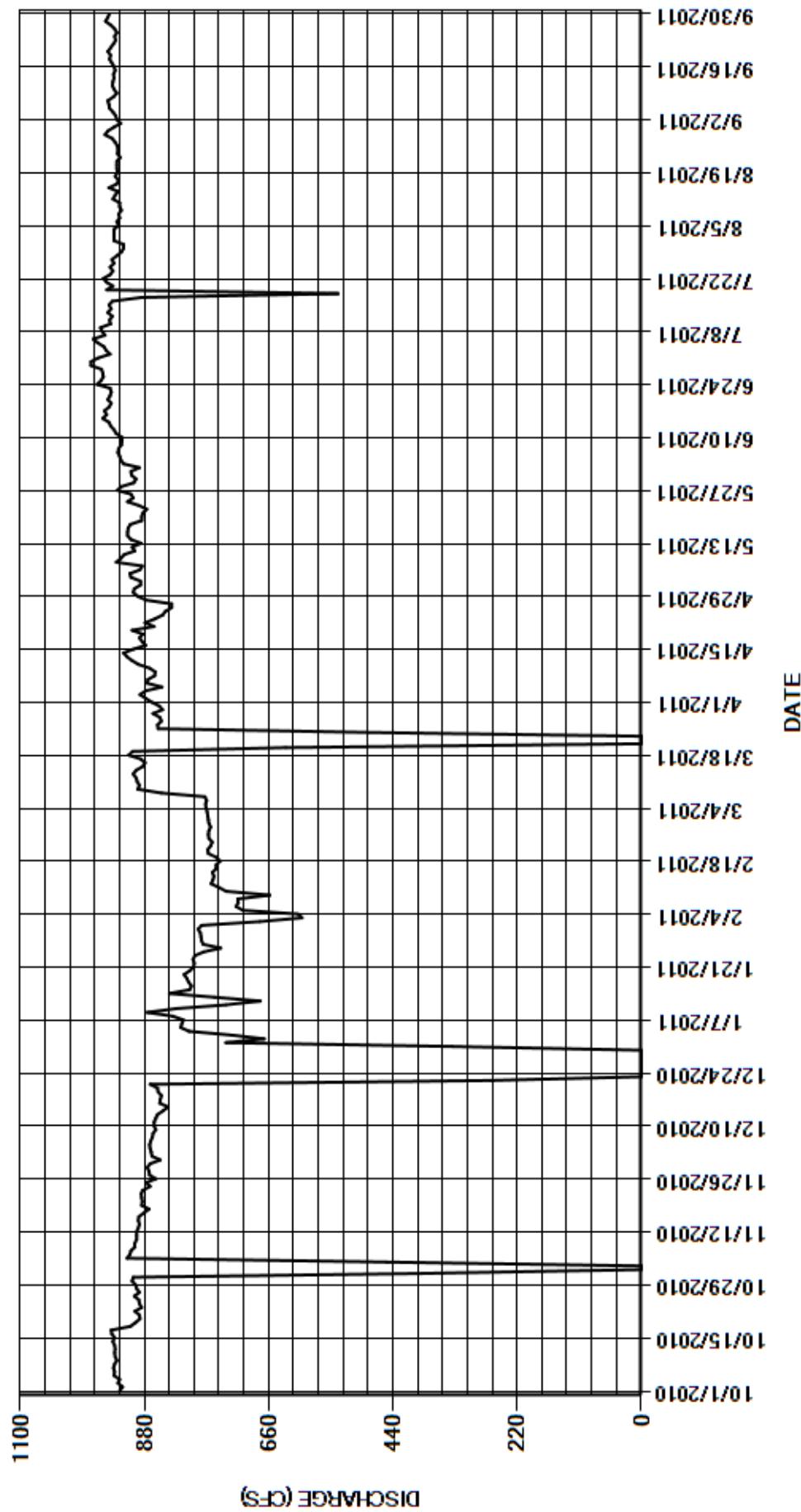
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	924	388	852	736	779	767	867	898	904	962	934	922
2	919	0.00	867	668	676	768	878	887	889	941	934	929
3	927	0.00	868	725	601	769	888	887	917	948	934	931
4	924	451	870	801	608	771	878	904	922	952	934	936
5	934	911	871	816	706	772	849	906	924	963	926	942
6	933	906	869	814	718	770	875	888	927	971	929	943
7	935	904	866	811	714	773	874	884	926	950	924	945
8	933	897	865	e830	715	850	862	930	921	955	926	935
9	929	897	860	e875	658	892	861	e922	920	958	921	929
10	932	e894	863	e824	735	889	871	916	920	940	924	934
11	933	e894	863	e736	748	893	891	897	930	e942	924	937
12	932	e894	860	e675	762	895	902	902	934	937	936	936
13	933	891	857	e756	759	900	911	886	940	e945	932	934
14	936	889	847	e836	757	895	917	904	943	939	927	935
15	933	891	838	e800	760	883	900	910	954	943	943	932
16	938	890	853	e797	753	879	878	910	947	937	929	934
17	939	881	852	e802	753	887	884	909	951	885	926	938
18	905	872	850	e805	746	908	889	905	943	537	932	942
19	896	885	856	810	753	901	883	885	939	947	928	940
20	888	884	857	800	767	630	902	885	945	e936	929	945
21	889	885	870	793	768	0.00	863	883	941	947	929	940
22	897	886	266	792	763	0.00	879	876	939	953	929	935
23	885	883	0.00	794	760	0.00	862	890	941	941	923	931
24	889	870	0.00	791	766	485	848	910	964	936	928	933
25	890	877	0.00	775	767	856	843	900	957	941	927	929
26	898	860	0.00	745	766	857	832	904	953	e934	928	933
27	889	871	0.00	776	763	850	832	928	954	938	932	940
28	894	872	0.00	779	766	853	878	921	956	e929	937	949
29	896	875	0.00	780	---	865	892	899	975	921	950	945
30	902	870	0.00	781	---	848	900	895	975	917	945	942
31	900	---	335	785	---	854	---	903	---	917	934	---
TOTAL	28352	23868.00	18655.00	24308	20587	23160.00	26289	27924	28151	28762	28854	28096
MEAN	915	796	602	784	735	747	876	901	938	928	931	937
AC-FT	56240	47340	37000	48210	40830	45940	52140	55390	55840	57050	57230	55730
MAX	939	911	871	875	779	908	917	930	975	971	950	949
MIN	885	0.00	0.00	668	601	0.00	832	876	889	537	921	922
CAL YR	2010	TOTAL	304871.00	MEAN	835	MAX	959	MIN	0.00	AC-FT	604700	
WTR YR	2011	TOTAL	307006.00	MEAN	841	MAX	975	MIN	0.00	AC-FT	608900	

MAX DISCH: 1020 CFS AT 15:15 ON JUL 06,2011 GH 7.74 FT (GH from ADVM Vertical Beam)

MAX GH: 7.77 FT AT 22:00 ON MAY 09,2011 (From ADVM Vertical Beam)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

REDLANDS CANAL NEAR GRAND JUNCTION
WY2011 HYDROGRAPH



GUNNISON RIVER BASIN
GUNNISON RIVER BELOW REDLANDS DIVERSION DAM
Water Year 2011

Location.--	Lat. 39°02'17 ", Long. 108°34'13", in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec 26, T.1 S., R.1 W., Ute Meridian, Mesa County, Hydrologic Unit 14020005, on the right bank of the Gunnison River just upstream of the Department of Energy Compound, about 1.6 miles above the mouth and the Colorado River, and about 0.78 miles below the Redlands Canal Diversion Dam.
Drainage Area and Period of Record.--	The drainage area is approximately 8020 square miles. Published by the Colorado Division of Water Resources, Office of the State Engineer since 2005.
Equipment.--	A Sutron Satlink 2 Logger high data rate DCP and a Sutron Constant Flow Bubbler (CFB). The shelter is a 48-inch CMP culvert on a concrete pad. The primary reference is an outside cantilever chain gage which can be used at low gage readings if the bank is trenched. It is used up to gage height 13.00 ft. The secondary reference gage is a section of staff gage that is carried to and placed at the top of the brass nut at the end of the orifice line. Gage height of the brass nut is 0.46 ft. This is used to calibrate the CFB at extremely low flows and is more accurate under these circumstances than the cantilever because the cantilever is 60+ ft. downstream. No other changes this water year.
Hydrologic Conditions.--	The control is the natural streambed with a somewhat stable cobble channel. There is very little ice in winter except for the coldest times in the year and this is not as apparent especially during higher flows around 1000 cfs. The Redlands Canal Diversion Dam is 0.78 miles upstream and diverts water in the range of 700 to 800 cfs all year for power generation, and during irrigation season it diverts an additional 60 cfs. Reservoirs upstream include Taylor Park Reservoir, Blue Mesa Reservoir, Morrow Point Reservoir, Crystal Reservoir, Paonia Reservoir, Silver Jack Reservoir, Crawford Reservoir and Ridgway Reservoir. The higher discharges probably starting around 10,000 cfs and flood flows around the range of 18,000 cfs may experience back water from the Colorado River.
Gage-Height Record.--	The primary record is the 15-minute bubbler data from satellite telemetry with DCP download data used for backup purposes. The record is complete and reliable except for the following days when ice affected the stage discharge relationship: Dec.31, 2010; Jan. 1-8, 10-14, 18, 22-28, 2011; and when the bubbler gave incorrect readings: Dec. 24-29, 2010; Feb 2-16, 20-23, 2011. The gage was visited on 16 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The bubbler was adjusted on 7 separate occasions this water year. The sensor corrections ranged from -0.05 ft. to +0.05 ft. All corrections made were prorated by time back to the last known matching readings.
Datum Corrections.--	Levels were last run on Mar 25, 2010 and a datum correction of -0.28 ft. was made based on BM No. 2. Levels were previously run in 2002.
Rating.--	The control is the natural streambed with a somewhat stable cobble channel. At high flows in the range of 18,000 cfs and above, backwater from the Colorado River may affect the control. Rating GUNREDCO04 in use since October 1, 2004, was used the entire Water Year. Nine discharge measurements (Nos. 137-145) were made during WY2011, ranging in discharge from 313 cfs to 7270 cfs. Measurements cover the range experienced, except the lower mean daily flows on Nov. 26; Dec 1, 9-19, 2010; Jan 1-3, 5, 6, 11, 23-26, 28-31; Feb 1-3, 2011; and the higher mean daily flows on May 9, 16, 17, 28-31; Jun 1-18, 2011. The peak instantaneous flow of 12,700 cfs occurred at 2345 Jun 8, 2011 at a gage height of 10.58 ft. with a shift of 0.12 ft. It exceeded measurement No. 143, made Jun. 15, 2011 by 3.46 feet in stage.
Discharge.--	Shifting control method was used during all periods of record. Three variable stage-shift relationships were used to distribute shifts throughout the entire water year. GUNREDVS11Coa, applied from 0000 Oct 1 2010 to 1515 Feb 23 2011; GUNREDCOvs11b, applied from 1530 Feb 23 2011 to 1230 May 13 2011. Shifts were distributed by time, through variable shift curves starting with GUNREDCOvs11b at 1245 May 13 2011 to variable shift curve GUNREDvs12a at 1245 Jun 15 2011; GUNREDvs12a, applied from 1300 Jun 15 2011 through the end of the water year. Measurements show unadjusted shifts varying from 0.02 ft. to 0.36 ft. All were given full weight and applied directly except Nos. 138, 141, and 142, which were discounted -3% to 5% to smooth shift distribution.
Special Computations.--	The ice effect this year was more severe compared to a normal year when anchor ice is typically present. During the lower flows and cold temperatures the river was frozen over above and below the gage. The shore ice did have effect on the stage. The ice periods were estimated using adjacent good record days, a graph of 15 min. data and from temperatures taken at the gage. These values were compared to the flows seen at the Gunnison River nr. Grand Junction and the Redlands Canal and then further refined. During the period when there were sensor problems, the gage height was estimated graphically using trends in the gage height plots on the monthly chart and making appropriate corrections during drastic spikes.
Remarks.--	The record is rated as good except when the stage-discharge relationship was affected by ice and when the CFB malfunctioned. Record affected by ice and CFB malfunction are estimated and considered poor. Record when the flow exceeded 10,900 cfs (Jun 7-10, 2011), is rated fair. Station maintained and record developed by Gerald M. Thrush.
Recommendations.--	A few higher measurements would extend the upper end of the rating curve. These are difficult because the high water measurements have to be made from a boat owned and operated by the Bureau of Reclamation, and the peak this year exceeded the safe operating range of the 60 hp motor. Scheduling difficulties, also, leads to missing high water opportunities. The use of ADCP measurements has allowed high water measurements that could not have been made at these flows by conventional methods. Levels need to be verified.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

GUNNISON RIVER BELOW REDLANDS DIVERSION DAM

RATING TABLE-- GUNREDSCO04 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

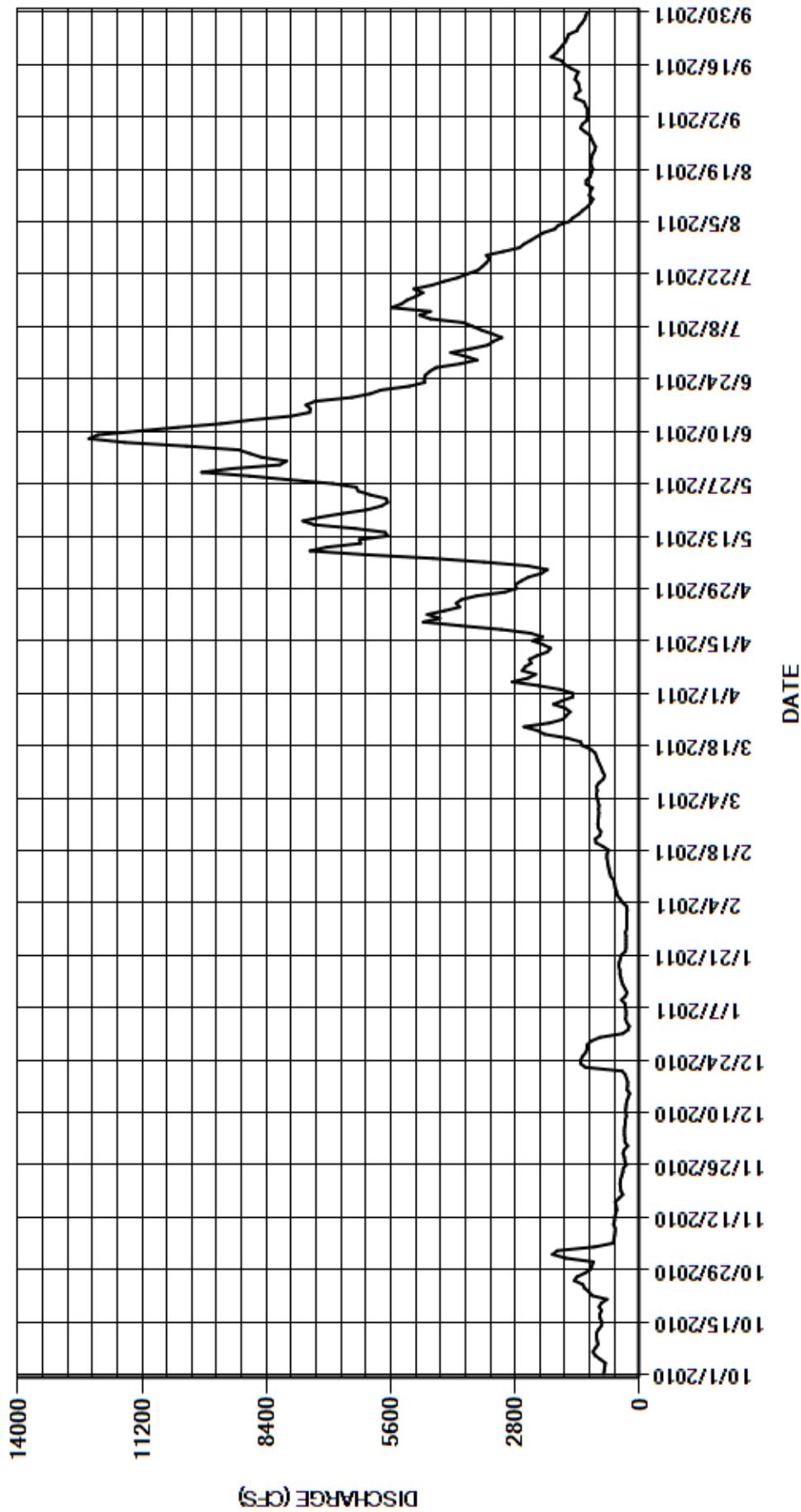
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	809	1660	267	e262	288	924	1510	2660	8100	4250	2310	1190
2	795	1960	327	e232	e280	911	1800	2500	7950	3800	2170	1180
3	783	1850	331	e290	e290	936	2280	2210	8510	3420	1910	1170
4	771	1010	343	e318	e380	957	2870	2080	8770	3290	1830	1170
5	888	596	346	e302	e440	972	2510	2520	9030	3100	1590	1220
6	999	578	336	e304	e500	951	2340	3500	10200	3320	1500	1250
7	1050	562	322	e320	e520	973	2640	4650	11600	3560	1370	1450
8	993	551	320	e328	e550	915	2580	6190	12400	3760	1280	1440
9	934	550	296	409	e565	817	2440	7420	12200	3960	1170	1340
10	955	585	311	e316	e580	783	2480	7040	11300	4710	1100	1360
11	971	564	310	e280	e650	833	2310	6280	10400	4950	1050	1380
12	969	556	301	e328	e670	860	2080	6310	9420	4710	1130	1450
13	920	534	286	e374	e690	902	2000	5670	8740	5590	1110	1420
14	854	512	257	e404	e710	942	2180	5730	7850	5360	1060	1380
15	852	528	223	421	e720	968	2410	6410	7430	5240	1200	1550
16	890	548	280	445	e740	1000	2180	7330	7410	5040	1200	1690
17	897	461	272	442	736	1100	2450	7580	7510	4880	1110	1760
18	854	378	265	e468	697	1290	3110	7190	7300	5080	1090	1990
19	912	420	294	459	818	1330	4040	6690	6480	4680	1050	1880
20	858	432	320	431	e982	1640	4870	6130	6060	4410	1090	1810
21	733	438	392	410	e997	2140	4500	5810	5820	4090	1100	1740
22	1070	426	1220	e318	e892	2300	4780	5670	5180	3880	1080	1670
23	1140	402	1330	e306	e873	2600	4390	5710	4840	3640	1060	1630
24	1240	376	e1320	e308	929	2030	4050	6070	4850	3540	1010	1600
25	1280	368	e1280	e306	939	1720	4130	6340	4820	3450	989	1410
26	1470	298	e1210	e304	929	1650	4010	6380	4720	3380	1040	1370
27	1410	333	e1180	e320	925	1560	3660	6910	4580	3450	1080	1300
28	1230	342	e1180	e290	915	1680	3030	7890	4040	3070	1110	1240
29	1110	372	e1090	292	---	1940	2770	8780	3660	2710	1230	1210
30	1070	344	895	289	---	1730	2800	9860	3920	2600	1330	1180
31	1040	---	e380	290	---	1500	---	9180	---	2450	1290	---
TOTAL	30747	18534	17484	10566	19205	40854	89200	184690	225090	123370	39639	43430
MEAN	992	618	564	341	686	1318	2973	5958	7503	3980	1279	1448
AC-FT	60990	36760	34680	20960	38090	81030	176900	366300	446500	244700	78620	86140
MAX	1470	1960	1330	468	997	2600	4870	9860	12400	5590	2310	1990
MIN	733	298	223	232	280	783	1510	2080	3660	2450	989	1170
CAL YR	2010	TOTAL	425650	MEAN	1166	MAX	6060	MIN	223	AC-FT	844300	
WTR YR	2011	TOTAL	842809	MEAN	2309	MAX	12400	MIN	223	AC-FT	1672000	

MAX DISCH: 12700 CFS AT 23:45 ON JUN 08,2011 GH 10.58 FT SHIFT 0.12 FT

MAX GH: 10.58 FT AT 23:45 ON JUN 08,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

GUNNISON RIVER BELOW REDLANDS DIVERSION DAM
WY2011 HYDROGRAPH



BLUE RIVER BASIN
BLUE RIVER AT HIGHWAY 9 BRIDGE BELOW BRECKENRIDGE
Water Year 2011

Location.--	Lat 39° 32' 25", long 106° 02' 25" in SE 1/4 of SW 1/4 of sec 7, T6S, R77W, Hydrologic Unit 14010004, in Summit County. Located on right bank 25 ft. above Highway 9 Bridge, 3 1/2 miles north of Breckenridge and 2 1/4 miles south of Dillon Reservoir(Blue River Arm).
Drainage Area and Period of Record.--	80.8 square miles. Satellite telemetry began Nov 25, 1996. Published streamflow record Oct 1, 1996 to present.
Equipment.--	Sutron shaft encoder (SE) and Sutron SatLink2 data collection platform (DCP) and in precast concrete building. A Sutron constant flow bubbler (CFB) was installed as a backup sensor on Jun 28, 2011. A Stevens A-71 graphic recorder that previously served as a backup record was removed at the end of water year 2011. The SE and CFB are set by drop tape to an adjustable reference point (RP) in edge of equipment shelf. Outside staff gage, near right bank adjacent to intake pipes, serves as a backup RP. Station has AC power that allows use of a stock tank heater and space heater to prevent water from freezing in stilling well and intake pipes.
Hydrologic Conditions.--	Transmountain diversions above the station occur through the Continental-Hoosier Tunnel and the Boreas Pass Ditch.
Gage-Height Record.--	The primary record is 15-minute satellite-transmitted SE gage height data from Oct 1, 2010 through June 28, 2011. Gage height data from the CFB were used to develop the record from Jun 28 - Sep 30, 2011. The record is complete and reliable, except during the following periods. Intakes were plugged from Nov 22 - 25, 2010, May 28 - 31 and Jun 6-28, 2011. The stilling well was frozen from Jan 22 - Feb 16, 2011. A steel plate was removed from the left culvert below the gage on Jun 6, which changed the rating condition. The intakes were plugged and the CFB orifice was above water from Sep 8 - 15, 2011. Several instrument corrections were applied during the period of record.
Datum Corrections.--	Levels were last run on Aug. 18, 2010 using RM 1 as base. The gage was found to read correct and no adjustments were made to the inside RP.
Rating.--	Low water control is rock and cobble riffle at the gage house. High water control is three 8 ft diameter culverts 25 ft below gage house under Highway 9. Channel is often mossy during the winter. Rating No. 11 (developed Nov. 16, 2010 using measurements 134-138) was used for all of Water Year 2011. The rating was compromised when a steel plate (which had blocked the left culvert below the gage for about 3 years) was removed by Summit County on Jun 6, 2011. Rating 11 was further compromised when the channel had to be excavated to expose the intake pipes on Sep 15, 2011. Eight discharge measurements (Nos. 138-145) made during Water Year 2011 and measurement 146 made subsequently were used for analysis. The measurements ranged from 26.4 to 482 cfs, which covers the range of discharge experienced except for the lower daily flows of Oct 1-4, 28-30, 2010 and Nov 9, 2010 through Apr 1, 2011 and the higher daily flows of Jun 17, 25-27, 30 and Jul 1-4, 6-15, 18-20, 2011. The peak discharge of 997 cfs occurred at 0630 on Jul 19, 2011 at a gage height of 3.76 ft with a shift of -0.06 ft.
Discharge.--	Shifts were distributed by time from the beginning of Water Year 2011 through Apr 14, 2011. Variable stage-shift curve BLUNINCO_VS2011 (developed from measurements 140-142) was used from Apr 14 until the steel plate was removed from the left culvert on Jun 5, 2011. Shifts were then distributed by time until the end of the water year. A major shift change occurred on Sep 15 when the channel was excavated to expose the intake pipes in the stream. Measurements made during the period of record indicate raw shifts ranging from -0.20 ft to +0.41 ft. Measurements 138, 139 and 140 were discounted from -4% to +5% to smooth the shift distribution.
Special Computations.--	Average daily discharge was estimated by hydrographic comparison with downstream BLUNDICO gage operated by USGS during periods of Nov 22-25, 2010, May 28-31, 2011, Jun 6-28, 2011 and Sep 8-15, 2011. Average daily discharge for periods of Jan 22-Feb 16, 2011 was estimated using straight-line pro-ration from adjacent good gage height data.
Remarks.--	Record is rated good except estimated periods when stilling well was frozen, intakes were plugged, and CFB orifice was above water, which are estimated and poor. Station was maintained by Craig Bruner and record was developed by James Kellogg.
Recommendations.--	Lower gage datum in WY2012 to remove negative gage height range in rating. Develop new rating after high water levels recede in 2012 and levels have been run. Make more gage visits and more measurements.

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BLUE RIVER AT HIGHWAY 9 BRIDGE BELOW BRECKENRIDGE

RATING TABLE-- BLUNINCO11 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

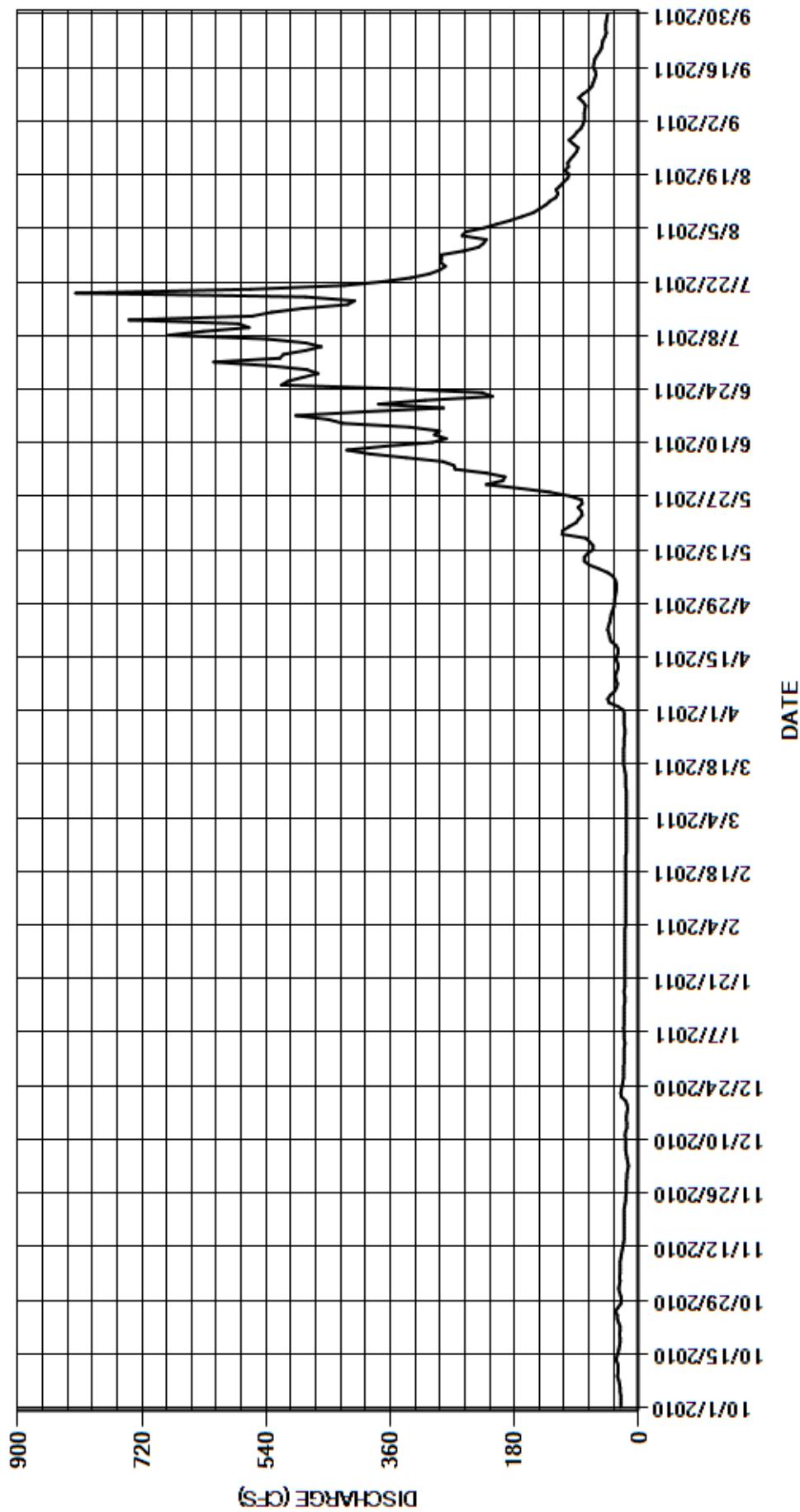
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	26	29	17	21	e20	18	22	34	194	616	225	81
2	26	28	16	21	e20	18	30	33	221	520	221	79
3	26	27	15	21	e20	18	43	32	266	515	256	79
4	26	28	16	20	e19	18	45	32	268	483	251	79
5	27	27	17	21	e19	18	41	34	284	460	225	78
6	27	27	18	21	e19	18	35	37	e337	483	206	77
7	28	27	19	21	e19	18	32	45	e390	539	186	81
8	29	27	19	22	e19	18	31	58	e423	681	169	e87
9	31	26	19	21	e19	18	33	72	e368	631	153	e81
10	30	25	19	21	e19	18	34	79	e299	565	144	e73
11	30	24	20	21	e19	18	32	79	e279	580	135	e68
12	30	23	19	21	e19	19	30	74	e296	739	129	e66
13	32	22	17	21	e19	19	30	66	e289	560	120	e64
14	32	21	17	21	e19	19	32	66	e332	532	117	e62
15	30	21	18	20	e19	19	32	71	e429	487	120	e63
16	29	21	18	20	e19	20	30	77	e450	422	114	66
17	28	21	17	21	19	21	30	111	e497	412	109	65
18	27	21	16	21	19	22	33	110	e398	483	103	64
19	27	21	17	20	19	22	40	101	e283	816	101	61
20	28	21	19	20	19	22	42	91	e377	563	107	57
21	27	21	25	20	19	22	43	87	e310	427	102	54
22	27	e21	26	e20	19	22	45	82	e212	371	103	53
23	29	e20	25	e20	18	21	44	83	e227	330	99	52
24	31	e19	24	e20	18	21	42	88	e345	304	94	49
25	31	e19	23	e20	18	21	41	82	e518	289	90	47
26	34	18	22	e20	18	20	40	83	e508	280	88	48
27	30	18	22	e20	18	20	38	100	e487	287	95	48
28	26	18	22	e20	18	21	36	129	e465	286	101	47
29	25	18	22	e20	---	21	35	e173	481	286	94	46
30	26	17	21	e20	---	21	35	e221	534	254	90	45
31	28	---	21	e20	---	21	---	e197	---	232	84	---
TOTAL	883	676	606	636	529	612	1076	2627	10767	14433	4231	1920
MEAN	28.5	22.5	19.5	20.5	18.9	19.7	35.9	84.7	359	466	136	64.0
AC-FT	1750	1340	1200	1260	1050	1210	2130	5210	21360	28630	8390	3810
MAX	34	29	26	22	20	22	45	221	534	816	256	87
MIN	25	17	15	20	18	18	22	32	194	232	84	45
CAL YR	2010	TOTAL	20200	MEAN	55.3	MAX	402	MIN	12	AC-FT	40070	
WTR YR	2011	TOTAL	38996	MEAN	107	MAX	816	MIN	15	AC-FT	77350	

MAX DISCH: 997 CFS AT 06:30 ON JUL 19,2011 GH 3.76 FT SHIFT -0.06 FT

MAX GH: 3.76 FT AT 06:30 ON JUL 19,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

BLUE RIVER AT HIGHWAY 9 BRIDGE BELOW BRECKENRIDGE
WY2011 HYDROGRAPH



BLUE RIVER BASIN
SNAKE RIVER AT KEYSTONE SKI AREA
Water Year 2011

Location.--	Lat 39°36'24", long 105°57'06", in NE1/4 NE1/4 Sec. 24, T5S, R77W in Summit County. Located on left bank of Snake River just below Keystone Ski Area snowmaking diversion, 0.5 mi below confluence with North Fork of Snake River, 1.5 mi above confluence with Keystone Gulch, and 3.2 mi upstream of Snake River Arm of Dillon Reservoir.
Drainage Area and Period of Record.--	The drainage area above the gage is 59.5 square miles. Partial year (winter) record published with data from Oct 1, 2005 to present.
Equipment.--	Sutron constant flow bubbler (CFB) sensor and Sutron SatLink 2 data collection platform (DCP) housed in the Keystone Ski Area snowmaking pumphouse. The CFB is calibrated to a staff gage located above rock weir control and below Keystone diversion dam.
Hydrologic Conditions.--	Drainage basin is the Snake River and North Fork of the Snake River. Record includes water pumped from Montezuma shaft of Roberts Tunnel that is not always diverted for snowmaking at Keystone Ski Area. Banks between the dam and control are steep and velocity is generally slow in reach below diversion. Channel below the control is composed of cobble and is relatively straight to the measurement section. There is one channel at all stages.
Gage-Height Record.--	The primary record is 15-minute satellite-transmitted data. The DCP log is used as a backup. The record is complete and reliable for the six month period of operation (Oct 1, 2010 – Mar 31, 2011) except for Oct 9-14, 2010, when the CFB sensor was malfunctioning. Several instrument calibration corrections were made to the CFB sensor during the period of record.
Datum Corrections.--	Levels were run on Sep 29, 2011, using RM 1 as a base. The staff gage was determined to read within 0.01 ft of given elevation, which is within tolerable limits. The staff gage elevation was not adjusted.
Rating.--	Control is a W-weir rock structure approximately 70 ft downstream of the Keystone snowmaking diversion point and 20 ft downstream of AccuBubble orifice pipe. Rating No. 12 was used for all of Water Year 2011. Four measurements (31–34) made during the period of record, were used for analysis. Measurements range in discharge from 12.5 to 30.6 cfs, which covered the range of flows experienced during the period of record except for lower daily flows of Nov 25, Dec 16-18, 25, 28, 2010; Jan 20, 22, 24-25, 28-31; Feb 1-28; and Mar 1-31, 2011. The peak discharge of 39.2 cfs occurred at 1245 on Oct 28, 2010 at a gage height of 2.08 ft with a shift of +0.06 ft. The peak gage height exceeded high measurement 32 by 0.10 ft in stage.
Discharge.--	A shifting control method was used for WY2011. Shifts were applied by time for the entire period of record. Measurements 32 and 33 were not given full weight and discounted +3% and -4%, respectively, to smooth application of shifts. Raw shifts ranged from +0.05 to +0.07 ft.
Special Computations.--	Discharges during period of bad gage height record on Oct 9-14, 2010 were estimated by hydrographic comparison with discharge record from upstream SNAMONCO gage operated by USGS. This comparison was valid for this period because snowmaking diversions were not in effect.
Remarks.--	Record is rated, as good except for days of estimated daily discharge which are considered fair. Gage operated by Craig Bruner. Record developed by James Kellogg.
Recommendations.--	Replace boulder that dislodged from rock weir control during spring high flows (after period of record) and develop new rating. Consider construction of a cantilever chain gage to replace staff gage.

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SNAKE RIVER AT KEYSTONE SKI AREA

RATING TABLE.-- SNAKEYCO12 USED FROM 01-OCT-2010 TO 30-SEP-2011

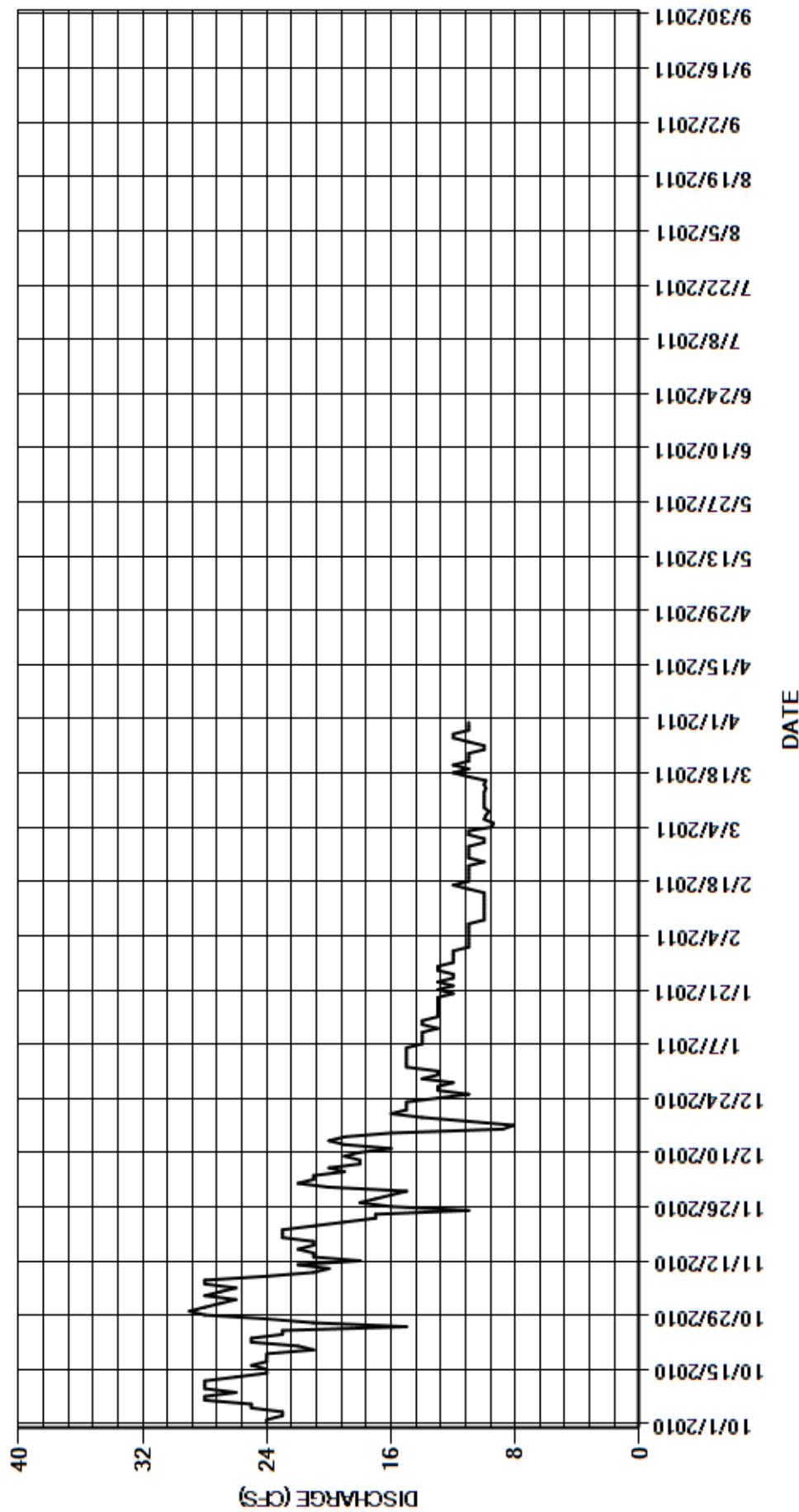
DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011												
DAY	MEAN VALUES											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	24	27	20	15	11	10	---	---	---	---	---	---
2	24	26	22	15	11	11	---	---	---	---	---	---
3	23	28	21	15	11	11	---	---	---	---	---	---
4	23	27	21	15	11	9.5	---	---	---	---	---	---
5	25	26	19	15	11	9.4	---	---	---	---	---	---
6	25	28	20	15	11	10	---	---	---	---	---	---
7	28	28	18	14	11	9.9	---	---	---	---	---	---
8	28	24	18	14	10	9.7	---	---	---	---	---	---
9	e26	21	19	14	10	10	---	---	---	---	---	---
10	e28	20	18	14	10	10	---	---	---	---	---	---
11	e28	22	16	13	10	10	---	---	---	---	---	---
12	e28	18	19	14	10	10	---	---	---	---	---	---
13	e26	21	20	14	10	10	---	---	---	---	---	---
14	e24	21	19	13	10	9.9	---	---	---	---	---	---
15	24	22	16	13	10	10	---	---	---	---	---	---
16	25	21	8.8	13	11	9.9	---	---	---	---	---	---
17	24	21	8.1	13	12	11	---	---	---	---	---	---
18	24	23	11	13	11	12	---	---	---	---	---	---
19	24	23	14	13	11	11	---	---	---	---	---	---
20	21	23	16	12	11	12	---	---	---	---	---	---
21	22	21	15	13	11	11	---	---	---	---	---	---
22	25	19	15	12	11	11	---	---	---	---	---	---
23	25	17	15	13	10	11	---	---	---	---	---	---
24	23	17	13	12	11	10	---	---	---	---	---	---
25	23	11	11	12	11	10	---	---	---	---	---	---
26	15	16	13	13	11	11	---	---	---	---	---	---
27	21	18	13	13	11	12	---	---	---	---	---	---
28	24	17	12	12	10	12	---	---	---	---	---	---
29	28	16	14	12	---	11	---	---	---	---	---	---
30	29	15	13	12	---	11	---	---	---	---	---	---
31	28	---	13	12	---	11	---	---	---	---	---	---
TOTAL	765	637	490.9	413	299	327.3	---	---	---	---	---	---
MEAN	24.7	21.2	15.8	13.3	10.7	10.6	---	---	---	---	---	---
AC-FT	1520	1260	974	819	593	649	---	---	---	---	---	---
MAX	29	28	22	15	12	12	---	---	---	---	---	---
MIN	15	11	8.1	12	10	9.4	---	---	---	---	---	---
CAL YR	2010	TOTAL	2911.4	MEAN	16.0	MAX	29	MIN	8.1	AC-FT	5770 (PARTIAL YEAR RECORD)	
WTR YR	2011	TOTAL	2932.2	MEAN	16.1	MAX	29	MIN	8.1	AC-FT	5820 (PARTIAL YEAR RECORD)	

MAX DISCH: 39.2 CFS AT 12:45 ON OCT 28,2010 GH 2.08 FT SHIFT 0.06 FT

MAX GH: 2.08 FT AT 12:45 ON OCT 28,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

SNAKE RIVER AT KEYSTONE SKI AREA
WY2011 HYDROGRAPH



ROARING FORK RIVER BASIN
ROARING FORK RIVER BELOW MAROON CREEK NEAR ASPEN
Water Year 2011

Location.--	Lat. 39°13'30", Long. 106°51'20", NW ¼ of SW¼ of Sec. 35, T.9 S., R.85 W. in Pitkin County, CO. Gage located on left bank at Aspen Consolidated Sanitation Plant, 0.8 mi downstream from confluence with Maroon Creek.
Drainage Area and Period of Record.--	Drainage area is 289 sq. mi. Published record November 1988 to present.
Equipment.--	Gage is equipped with Stevens A-71 graphic water-stage recorder and Sutron Model 56-0540 shaft encoder and Sutron SatLink2 data collection platform (DCP) housed in precast concrete building and a 12-ft deep stilling well constructed of precast concrete rings. Recorder and shaft encoder have separate floats and are set by drop tape from an adjustable reference point in edge of equipment shelf.
Hydrologic Conditions.--	Upstream transmountain diversions occur through Hunter Tunnel (part of Fryingpan-Arkansas system) and Twin Lakes Tunnel. Building is equipped with AC power that allows use of a space heater and a stock tank heater, which help keep the well and intakes from freezing. Anchor ice often forms in the riffle control during cold weather and causes a backwater affect.
Gage-Height Record.--	Primary record is 15-minute satellite data. Chart data is used for backup. The record is complete and reliable, except for Nov 25-29, 2010, Jan. 1-14 and Feb 2-14, 2011 when the stage-discharge relationship was affected by anchor ice in the riffle control. No instrument corrections or flush corrections were made during Water Year 2011. The intakes were buried by cobbles and boulders from about Jul 5 (peak gage height) through the end of WY 2011. During this period, the intakes could not be flushed, but gage heights appeared to be reasonably accurate.
Datum Corrections.--	Levels were not run this water year. Levels were last run on Oct 6, 2008. Using RM 2 as a base, the gage was found to read correct and the R.P. was not adjusted.
Rating.--	<p>Channel is composed of cobble throughout and is straight from 400 ft above to 100 ft below the gage. Banks are steep on right bank and medium on left bank. The low flow control is a rock and cobble riffle about 80 ft below the gage. High flow control is 15 ft diameter boulder about 100 ft downstream of gage. During rising high flows of WY 2011, cobbles and boulders were deposited in the control and channel cross-section. This changed hydrologic conditions in the reach of the river adjacent to the gage and resulted in large shifts with respect to Rating 6.</p> <p>Nine measurements (Nos. 213-221) were made during Water Year 2011. Measurements ranged from 113 to 1510 cfs, which covered the range experienced during the year except for the lower daily flows on Dec 17, 25-26, 28, 31, 2010 and Jan 15-24, 26 - Apr 1, 2011 and the higher daily flows of Jun 5-20, 23 - Jul 11, 2011. The peak discharge of 2880 cfs occurred at 2330 on Jul 5, 2011 at a gage height of 6.09 ft with a shift of 0.38 ft. The peak gage height exceeded high measurement No. 218 by 1.07 ft in stage.</p>
Discharge.--	Shifting control method used for Water Year 2011. Shifts were distributed by time from Oct 1, 2010 - Apr 28, 2011 and Aug 12 - Sep 30, 2011. Variable stage-stage shift relationships ROABMCCO_VSC01 and ROABMCCO_VSC02 were developed from measurements 216 - 220 and the peak gage height. The stage shift curves were applied from Apr 28 - Aug 12, 2011 with the peak gage height as the transition point. Discharge measurements made this water year indicated shifts ranging from -0.01 to +0.38 ft. Measurements 214 and 215 were discounted -2% and +2%, respectively, to smooth the shift distribution.
Special Computations.--	Discharge estimates for ice-affected days were based on straight-line pro-ration from adjacent days with good electronic gage height data. As a general check, a hydrographic comparison was made to upstream gage on the Roaring Fork River near Aspen (operated by USGS in non-winter months). Three major tributaries are located between the gages, however, flow trends at the two gages were reasonably consistent during WY 2011.
Remarks.--	Record is good, except during periods of ice-affected control when record is rated as fair. Gage operated and maintained by Craig Bruner and Jana Miller and record developed by Jana Miller.
Recommendations.--	Cableway is due for inspection. Develop a new rating after several measurements can be made to evaluate the effects of high flows in WY 2012. Propose to Aspen Consolidated Sanitation District that chart recorder be replaced with a stage discharge recorder.

STATE OF COLORADO
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ROARING FORK RIVER BELOW MAROON CREEK NEAR ASPEN

RATING TABLE-- ROABMCC06 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

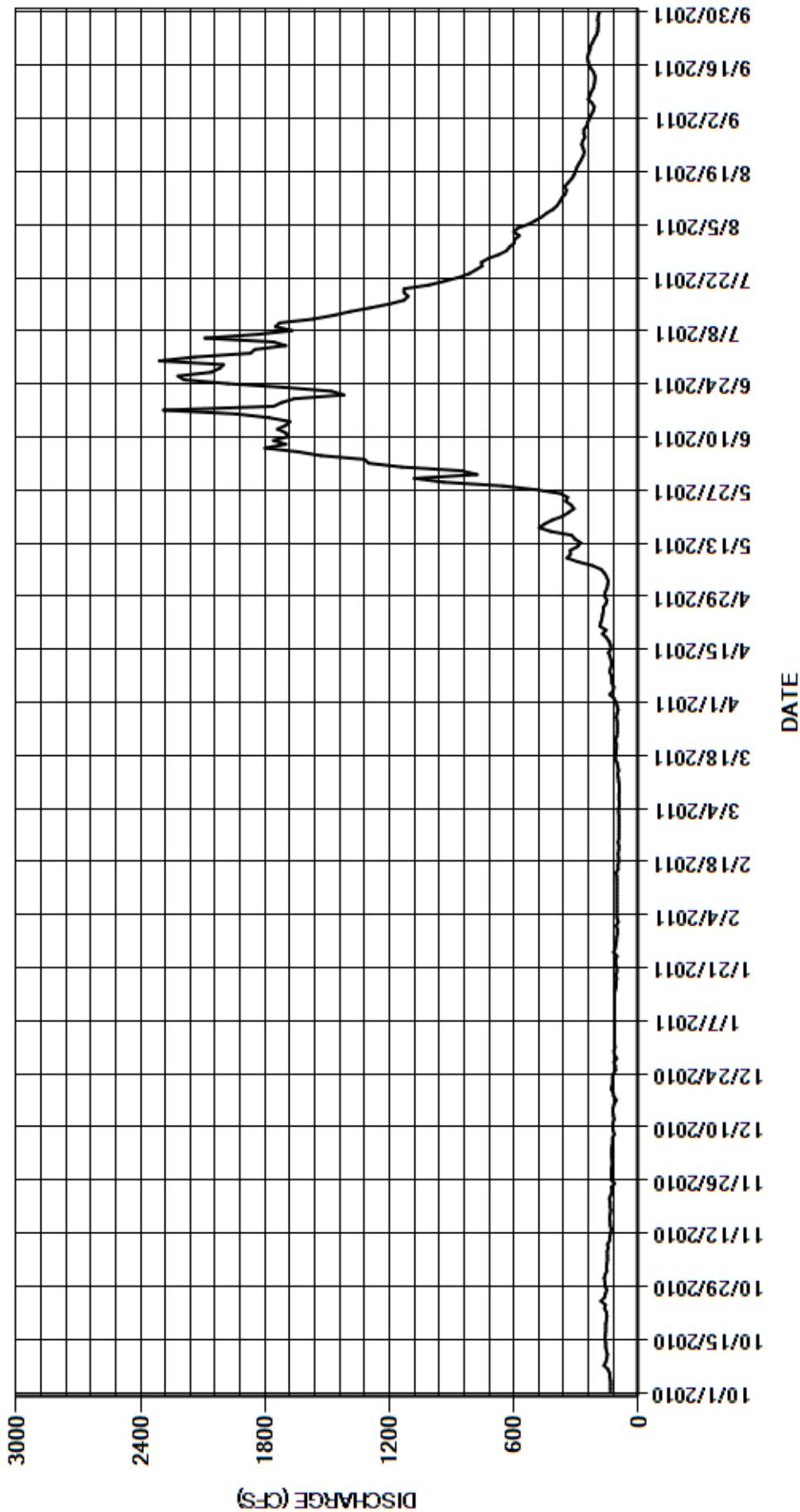
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	135	160	127	e116	107	93	108	152	853	2140	597	244
2	135	152	129	e116	e97	94	118	148	1140	1870	574	234
3	134	154	129	e116	e103	96	138	146	1300	1850	601	227
4	135	152	129	e116	e103	95	122	153	1320	1700	583	217
5	138	149	127	e116	e103	92	119	164	1530	1760	531	213
6	139	150	124	e116	e103	93	128	180	1640	2090	497	224
7	147	151	125	e116	e103	93	128	222	1800	1830	465	242
8	166	146	116	e116	e103	93	131	292	1700	1670	441	234
9	157	149	122	e116	e103	92	139	344	1760	1750	411	227
10	152	138	124	e116	e103	92	134	327	1690	1730	391	217
11	150	138	123	e116	e103	95	129	329	1700	1570	379	213
12	155	134	117	e116	e103	97	132	294	1740	1470	369	210
13	158	131	121	e116	e103	100	137	278	1700	1390	353	209
14	158	136	123	e116	e104	96	144	306	1680	1290	347	215
15	161	137	122	112	107	99	133	322	1780	1200	355	227
16	160	139	117	107	97	103	134	422	1940	1130	339	238
17	158	136	106	108	99	112	142	478	2290	1110	322	242
18	158	133	119	105	94	108	154	452	1760	1130	311	246
19	158	137	122	108	96	107	173	416	1720	1130	303	241
20	154	136	132	104	98	106	156	366	1660	1010	297	234
21	152	140	126	104	95	106	186	337	1420	936	287	231
22	154	133	124	110	94	112	181	311	1480	866	276	221
23	163	127	125	110	98	104	176	325	1710	816	267	213
24	159	131	120	104	94	102	173	351	1980	784	261	202
25	181	e114	110	119	94	101	169	341	2190	754	266	196
26	163	e131	112	112	94	102	169	374	2220	757	273	195
27	159	e131	118	109	93	103	156	493	2060	724	269	194
28	152	e131	105	106	93	106	152	652	2020	674	258	196
29	162	e131	116	105	---	103	164	940	2000	637	264	194
30	162	126	118	101	---	98	160	1080	2310	622	263	188
31	165	---	112	101	---	103	---	778	---	600	249	---
TOTAL	4780	4153	3740	3449	2787	3096	4385	11773	52093	38990	11399	6584
MEAN	154	138	121	111	99.5	99.9	146	380	1736	1258	368	219
AC-FT	9480	8240	7420	6840	5530	6140	8700	23350	103300	77340	22610	13060
MAX	181	160	132	119	107	112	186	1080	2310	2140	601	246
MIN	134	114	105	101	93	92	108	146	853	600	249	188
CAL YR	2010	TOTAL	102521	MEAN	281	MAX	2770	MIN	71	AC-FT	203400	
WTR YR	2011	TOTAL	147229	MEAN	403	MAX	2310	MIN	92	AC-FT	292000	

MAX DISCH: 2880 CFS AT 23:30 ON JUL 05,2011 GH 6.09 FT SHIFT 0.38 FT

MAX GH: 6.09 FT AT 23:30 ON JUL 05,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ROARINGFORK RIVER BELOW MAROON CREEK NEAR ASPEN
WY2011 HYDROGRAPH



ROARING FORK RIVER BASIN
ROARING FORK RIVER AB FRYINGPAN RIVER NR BASALT
Water Year 2011

Location.--	Lat 39°21'40", Long 107°01'44" in SW 1/4 of NE 1/4 of Sec. 18, T8S, R86W in Pitkin County. Located on left bank of Roaring Fork River, just below Highway 82 bridge, 0.5 mi. above confluence with Fryingpan River, and 2.5 mi above confluence with Sopris Creek.
Drainage Area and Period of Record.--	Drainage area is 511 square miles. Station constructed Oct. 2006 with satellite telemetry equipment. Gage operated by State of Colorado Division of Water Resources at same location and datum since establishment.
Equipment.--	Sutron Constant Flow Bubbler (CFB) sensor and Sutron SatLink 2 data collection platform (DCP) housed in 2 ft rectangular steel shelter. The CFB is referenced to an outside cantilever chain gage that is adjacent to the shelter.
Hydrologic Conditions.--	Drainage basin is upper reach of Roaring Fork Valley. Transmountain diversions from several tributaries at the upper end of the basin occur seasonally. Confluence with Fryingpan River is about ½ mi. downstream. The gage is operated from Apr 1 through Sep 30.
Gage-Height Record.--	The primary record is 15-minute CFB data downloaded from the DCP. Satellite-transmitted data are used as backup. The record is complete and reliable for the period of record (Apr 1 – Sep 30, 2011) except for numerous periods in August and September when the CFB orifice was unstable. Calibration corrections to the CFB sensor were made throughout the period of record.
Datum Corrections.--	Levels were run on May 13, 2010. Using RM 1 as a base, the outside cantilever gage was found to read correct and no adjustment was made.
Rating.--	Control is cobble and boulder channel. Left side of channel at gage is a steep bank and subject to cobble deposition since June 2010. Right side of channel slopes gently to a cobble bar with moderate willow growth. At higher stages, flow rises above the cobbles and willows on right bank. Minor algae growth occurs. Rating No. 6 in use since June 5, 2010 was used for the entire water year. Seven discharge measurements (Nos. 22-28) were made this water year, ranging in discharge from 236 to 2900 cfs. Measurements cover the range of discharge experienced during the period of record except for the lower daily flows on Apr 1-17; May 3; and Sep 3-5, 2011 and the higher daily flows of June 16-19, 24-30, and July 1-10, 2011. The peak discharge of 5100 cfs occurred at 0300 on July 6, 2011 at a gage height of 5.54 ft with a shift of 0.06 ft. It exceeded the stage of measurement No. 24 by 1.22 ft. in stage.
Discharge.--	Shifting control method was used for the entire period of record in WY 2011. Shifts were applied as defined by measurements and were distributed by time and stage. Two variable shift curves (ROAFRYCOVS1a and ROAFRYCOVS2a) were developed and used during the period of record. ROAFRYCOVS1a was used from 0000 on Apr 1, 2011 until the peak gage height at 0300 on July 6, 2011. Variable shift curve ROAFRYCOVS2a was used from the peak gage height at 0315 on July 6, 2011 until 1315 on August 18, 2011. Shifts were distributed by time from 1330 on August 18, 2011 until the end of the water year. Measurements showed shifts for WY 2011 ranged from +0.03 to +0.27 ft. All measurements were given full weight and applied directly except for measurement No. 23, which was discounted -2% to smooth shift distribution.
Special Computations.--	The CFB orifice appears to have been unstable from July through September. Erratic GH peaks and dips were smoothed based on adjacent good GH record. Additionally, instrument corrections were applied during 14 periods in August and September to correct GH data when the CFB orifice was loose and moving.
Remarks.--	Record is rated as good except for periods of corrected gage height which are rated as fair. Gaging station operated and maintained and record developed by Jana Miller and James Kellogg.
Recommendations.--	Channel dynamics since June 2010 have resulted in cobble deposition in the left side of the channel at the gage cross section. This trend is problematic to gage operation and discharge measurements. Continue cooperation with CWCB to design and construct cableway about 700 feet downstream of gaging station and move the gage downstream to the proposed cableway location. Use cableway to obtain better quality high-stage discharge measurements and better define upper end of stage-discharge rating. More measurements in high water will also help define the rating curve. Also, evaluate the need for new stage-discharge relationship after the high water recedes in WY2012. Stabilize the CFB orifice for WY2012 and run levels to determine the new point of zero flow.

STATE OF COLORADO
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ROARING FORK RIVER AB FRYINGPAN RIVER NR BASALT

RATING TABLE-- ROAFRYCO06 USED FROM 01-APR-2011 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

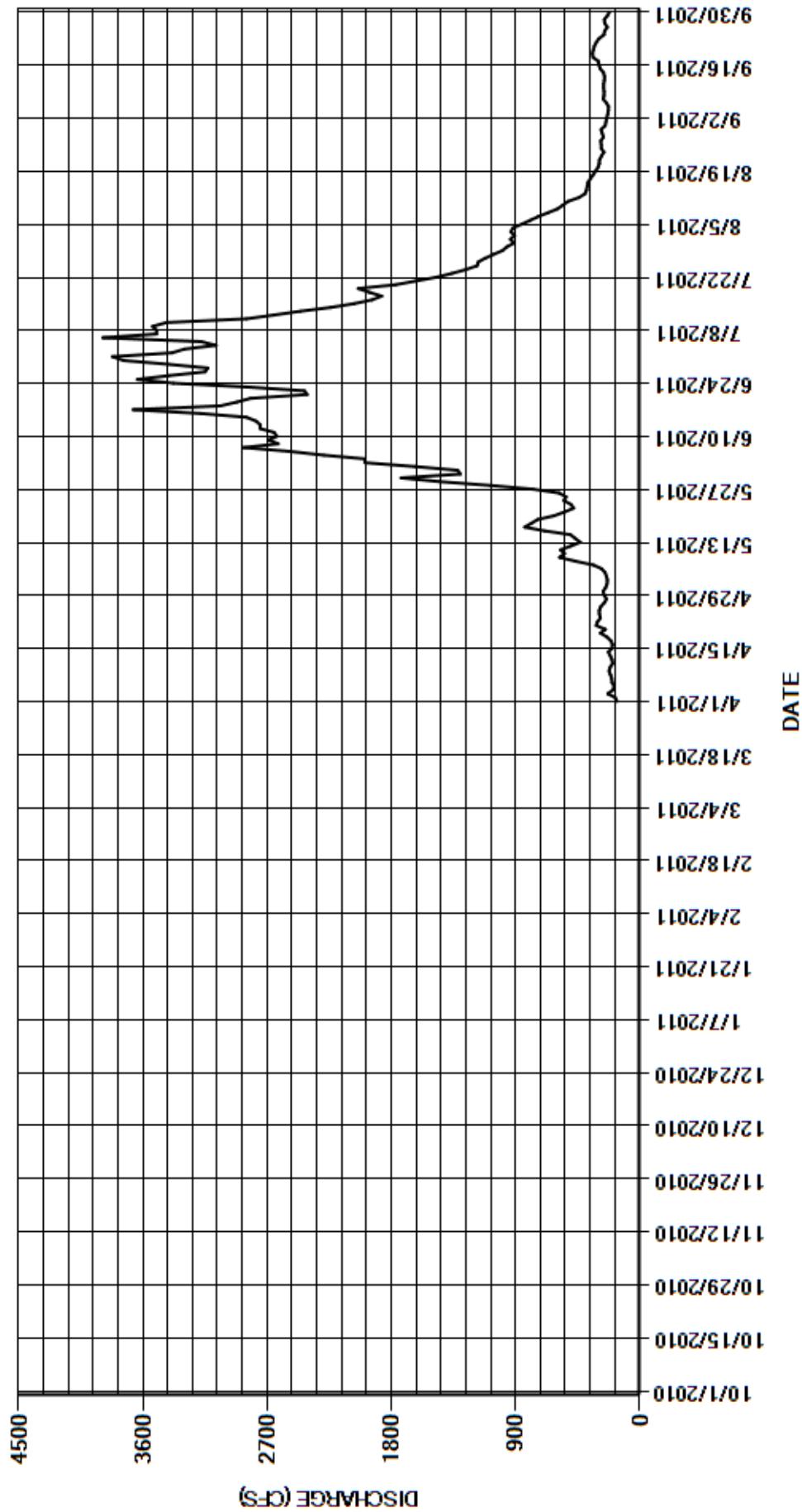
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	165	248	1320	3820	938	246
2	---	---	---	---	---	---	179	238	1630	3390	907	241
3	---	---	---	---	---	---	232	235	1990	3300	935	233
4	---	---	---	---	---	---	195	242	1990	3070	918	228
5	---	---	---	---	---	---	186	252	2290	3180	854	226
6	---	---	---	---	---	---	202	277	2540	3890	795	242
7	---	---	---	---	---	---	204	337	2870	3500	736	265
8	---	---	---	---	---	---	213	467	2620	3500	666	260
9	---	---	---	---	---	---	223	581	2690	3530	597	259
10	---	---	---	---	---	---	215	546	2630	3430	558	263
11	---	---	---	---	---	---	197	574	2650	2850	521	262
12	---	---	---	---	---	---	202	500	2750	2650	442	258
13	---	---	---	---	---	---	214	431	2750	2460	398	256
14	---	---	---	---	---	---	228	468	2780	2240	386	263
15	---	---	---	---	---	---	202	503	2850	2070	382	286
16	---	---	---	---	---	---	199	689	3180	1940	376	296
17	---	---	---	---	---	---	210	834	3670	1870	358	301
18	---	---	---	---	---	---	239	786	3040	1960	339	338
19	---	---	---	---	---	---	285	740	2920	2040	321	344
20	---	---	---	---	---	---	250	621	2820	1770	303	337
21	---	---	---	---	---	---	316	545	2410	1620	294	329
22	---	---	---	---	---	---	307	479	2430	1470	292	316
23	---	---	---	---	---	---	286	500	2850	1360	278	296
24	---	---	---	---	---	---	293	551	3380	1260	260	260
25	---	---	---	---	---	---	294	534	3640	1180	280	255
26	---	---	---	---	---	---	283	585	3410	1170	280	236
27	---	---	---	---	---	---	258	772	3150	1120	283	254
28	---	---	---	---	---	---	242	1080	3130	1060	264	258
29	---	---	---	---	---	---	258	1450	3420	996	273	236
30	---	---	---	---	---	---	266	1730	3740	963	281	220
31	---	---	---	---	---	---	---	1300	---	912	251	---
TOTAL	---	---	---	---	---	---	7043	19095	83540	69571	14766	8064
MEAN	---	---	---	---	---	---	235	616	2785	2244	476	269
AC-FT	---	---	---	---	---	---	13970	37870	165700	138000	29290	15990
MAX	---	---	---	---	---	---	316	1730	3740	3890	938	344
MIN	---	---	---	---	---	---	165	235	1320	912	251	220
CAL YR	2010	TOTAL	115743	MEAN	632	MAX	4980	MIN	119	AC-FT	229600	(PARTIAL YEAR RECORD)
WTR YR	2011	TOTAL	202079	MEAN	1104	MAX	3890	MIN	165	AC-FT	400800	(PARTIAL YEAR RECORD)

MAX DISCH: 5100 CFS AT 03:00 ON JUL 06,2011 GH 5.54 FT SHIFT 0.06 FT

MAX GH: 5.54 FT AT 03:00 ON JUL 06,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ROARING FORK RIVER AB FRYINGPAN RIVER NR BASALT
WY2011 HYDROGRAPH



ROARING FORK RIVER BASIN
09077200 FRYINGPAN RIVER NEAR IVANHOE LAKE
Water Year 2011

Location.--	Lat. 39° 14' 42", Long. 106° 31' 50", unsurveyed in Pitkin County, Hydrologic Unit 14010004. Located on left bank 100 ft downstream from diversion dam, 2 mi southwest of Ivanhoe Lake, and 9.1 mi southeast of Norrie, CO.
Drainage Area and Period of Record.--	18.7 sq mi. from topographic map.
Equipment.--	Sutron Model SDR-0001-4 stage discharge recorder in 3'-0" square doghouse style metal-clad shelter on 24" diameter corrugated metal stilling well located directly in stream. SDR is set by drop tape to an inside reference point on edge of equipment shelf. The SDR is hardwired to Chapman control house where a SatLink2 data collection platform (DCP) provides satellite transmission.
Hydrologic Conditions.--	Drainage basin is National Forest land, primarily wilderness area. Diversion dam is just upstream of gage. Diverted water and discharge from Fryingpan-Arkansas collection tunnels (north and south tunnels converge above station) flow into Charles H. Boustead Tunnel, which carries water transmountain to the Arkansas River basin (since May 16, 1972). Well and control freeze during winter months.
Gage-Height Record.--	The primary record is 15-minute data downloaded from the SDR. Satellite transmitted data is used as backup when available. The record is complete and reliable for water year 2011, except for periods when stilling well and control were frozen (Oct 25 - 30, 2010 and Nov 9, 2010- Apr. 13, 2011) and more than 4 hours of continuous gage height data were missing (Oct 1, 2010 and Sep 7, 2011). No instrument corrections were required during the period of record.
Datum Corrections.--	Levels were run on Sep 1, 2011. Using RM 2 as a base, the gage was found to read correct and the R.P. was not adjusted.
Rating.--	Channel is composed of boulders and cobbles. Control is a 9.8 ft wide rectangular concrete weir. Rating No. 8 in use since Oct. 1, 2003 was used until Oct. 6, 2010. Rating No. 9 was developed and used from Oct. 6, 2010 until the end of the water year. Six discharge measurements (382-387) made during water year 2011 were used for analysis. The measurements ranged in discharge from 5.89 cfs to 136 cfs which covered the daily discharge range experienced during the period of record except for lower daily flows on Dec 29, 31, 2010; Jan 4-31; Feb 1-28; Mar 1-31; and Apr 1-16, 2011. The peak gage height of 2.53 ft was facilitated by the USBR opening the diversion bypass gate to create high flow measurement conditions for refining the stage-discharge relationship. The peak discharge of 141 cfs occurred at 1230 on Jul. 20, 2011 at a gage height of 2.53 ft with a shift of 0.00 ft. It exceeded the stage of Measurement No. 385, made on Jul. 20, 2011 by 0.05 ft.
Discharge.--	Shifting control method was used during the entire water year. Shifts were applied as defined by measurements and were distributed by time for the entire water year. Open water measurements show raw shifts varying from -0.04 ft to +0.01 ft. Shifts were applied directly and given full weight except for Measurements Nos. 383, 384, 386 and 387 which were discounted from -6% to 7% to smooth shift distribution.
Special Computations.--	Average daily discharges for periods of frozen well (Oct 25 – 30 and Nov 9 – Apr 13) were estimated from hydrographic comparison with the downstream gage on the Fryingpan River near Thomasville gage (FRYTHOCO). Diversions associated with the Fryingpan-Arkansas project were not occurring during the estimated periods of record, which allows reasonable estimates of discharge using this method. Missing gage height data On Oct 1 and Sep 7 were estimated by straight-line interpolation from adjacent good gage height data.
Remarks.--	Record is good, except for periods of no gage height record, which is poor. Gaging station operated and record developed by Craig Bruner.
Recommendations.--	None.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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09077200 FRYINGPAN RIVER NEAR IVANHOE LAKE

RATING TABLE-- FRYIVLCO08 USED FROM 01-OCT-2010 TO 06-OCT-2010
FRYIVLCO09 USED FROM 06-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e11	12	e7.5	e5.9	e4.1	e3.1	e2.3	6.1	14	12	16	28
2	11	11	e7.5	e6.1	e4.0	e3.0	e2.9	6.1	14	12	27	27
3	11	11	e7.4	e6.2	e4.0	e3.0	e4.3	5.9	14	12	30	26
4	12	12	e7.4	e5.6	e4.0	e3.1	e3.9	6.5	14	12	30	24
5	12	12	e7.3	e5.3	e3.9	e3.0	e3.5	7.8	14	12	34	23
6	14	12	e7.3	e4.9	e3.9	e3.0	e3.9	9.5	14	12	36	25
7	16	11	e7.2	e4.9	e3.8	e2.9	e3.8	10	14	12	38	e26
8	17	12	e6.5	e4.8	e3.8	e2.9	e3.9	6.9	14	12	39	27
9	15	e13	e7.4	e4.8	e3.8	e2.9	e4.2	6.2	14	12	39	24
10	14	e9.6	e7.1	e4.7	e3.7	e2.8	e3.9	8.8	14	12	42	22
11	14	e10	e6.6	e5.1	e3.8	e2.8	e3.4	12	14	12	41	22
12	13	e9.2	e6.8	e5.6	e3.8	e2.7	e3.6	12	14	12	40	21
13	12	e8.6	e7.0	e5.2	e3.7	e2.7	e3.5	12	14	12	38	21
14	12	e10	e7.2	e4.6	e3.7	e2.6	3.5	12	14	12	38	22
15	11	e10	e7.1	e4.6	e3.7	e2.6	3.4	12	14	12	38	25
16	11	e10	e6.8	e4.3	e3.6	e2.6	3.9	13	14	12	37	24
17	11	e9.5	e6.3	e4.3	e3.6	e2.9	6.5	14	14	12	36	23
18	11	e9.2	e6.7	e4.3	e3.5	e3.0	7.1	14	14	12	34	22
19	11	e9.7	e6.7	e4.2	e3.5	e3.0	7.6	14	14	12	32	21
20	11	e9.9	e6.9	e4.2	e3.4	e3.1	7.4	14	14	21	32	20
21	11	e9.8	e7.3	e4.3	e3.4	e3.1	8.1	14	14	11	31	19
22	12	e8.7	e7.0	e4.3	e3.4	e3.3	7.9	14	14	12	30	19
23	12	e8.4	e6.7	e4.1	e3.3	e3.1	7.4	14	14	11	29	18
24	12	e8.6	e6.5	e4.2	e3.3	e3.1	7.1	14	14	12	28	18
25	e18	e7.3	e6.0	e4.0	e3.2	e3.2	7.1	14	14	12	31	17
26	e13	e8.5	e6.4	e4.0	e3.2	e2.8	7.0	14	14	20	34	16
27	e12	e8.5	e7.0	e3.9	e3.2	e2.6	6.5	13	14	28	37	16
28	e10	e8.2	e6.5	e3.9	e3.1	e2.5	6.3	12	14	36	33	16
29	e13	e7.9	e5.8	e4.2	---	e2.4	6.7	12	14	45	36	15
30	e12	e7.6	e6.0	e4.1	---	e2.4	6.2	14	13	49	33	15
31	12	---	e5.7	e4.1	---	e2.3	---	14	---	40	29	---
TOTAL	387	295.2	211.6	144.7	101.4	88.5	156.8	351.8	419	525	1048	642
MEAN	12.5	9.84	6.83	4.67	3.62	2.85	5.23	11.3	14.0	16.9	33.8	21.4
AC-FT	768	586	420	287	201	176	311	698	831	1040	2080	1270
MAX	18	13	7.5	6.2	4.1	3.3	8.1	14	14	49	42	28
MIN	10	7.3	5.7	3.9	3.1	2.3	2.3	5.9	13	11	16	15

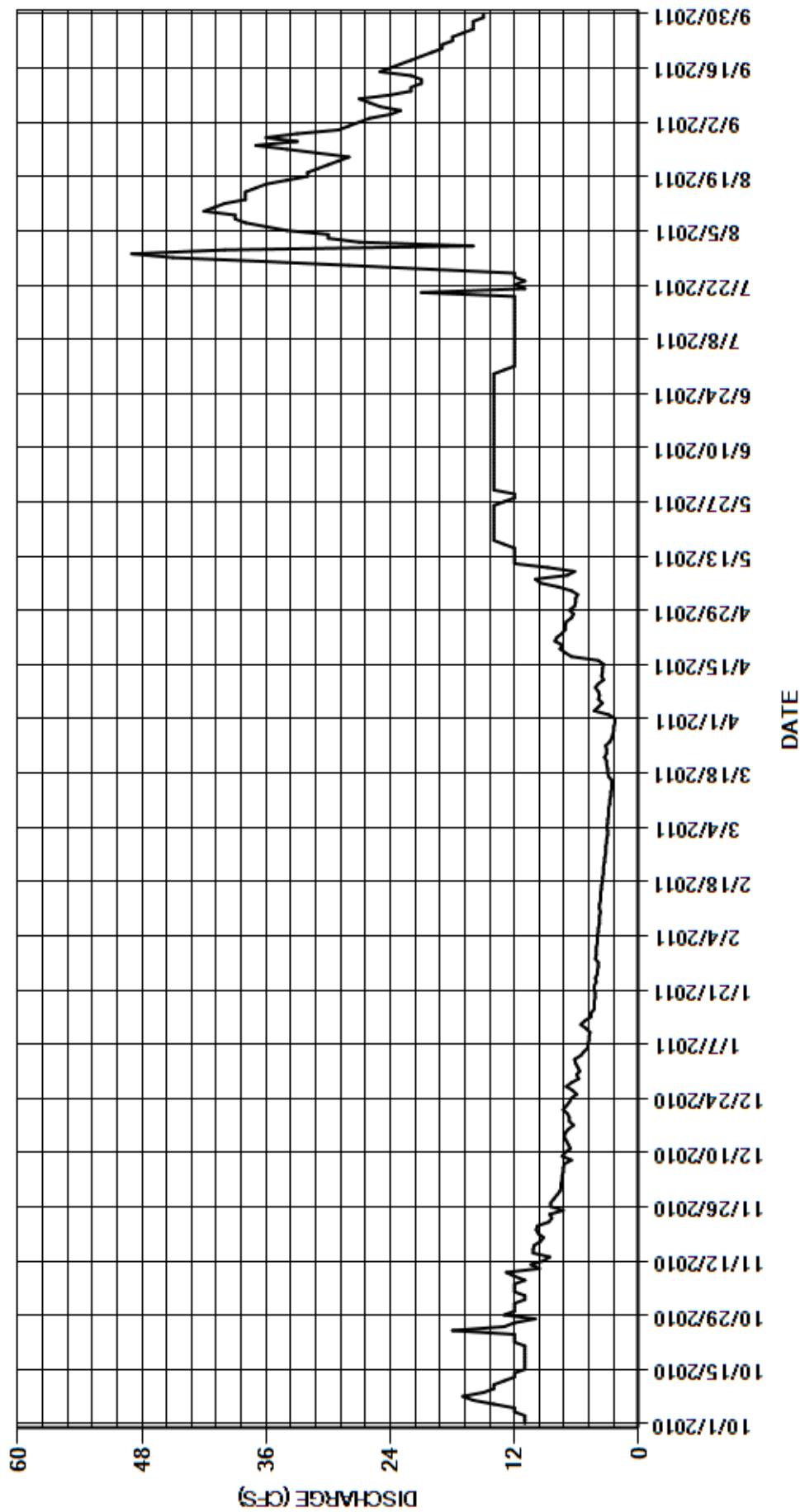
CAL YR	2010	TOTAL	5719.4	MEAN	15.7	MAX	110	MIN	1.8	AC-FT	11340
WTR YR	2011	TOTAL	4371.0	MEAN	12.0	MAX	49	MIN	2.3	AC-FT	8670

MAX DISCH: 141 CFS AT 12:30 ON JUL 20,2011 GH 2.53 FT SHIFT 0 FT

MAX GH: 2.53 FT AT 12:30 ON JUL 20,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09077200 FRYINGPAN RIVER NEAR IVANHOE LAKE
WY2011 HYDROGRAPH



ROARING FORK RIVER BASIN
09077610 IVANHOE CREEK NEAR NAST
Water Year 2011

Location.--	Lat. 39°17'13", Long. 106°33'31", unsurveyed, Pitkin County, Hydrologic Unit 14010004, on left bank 60 ft upstream from culvert under Nast Tunnel, 300 ft downstream from diversion dam, 2.3 mi east of Nast, and 5.8 mi southeast of Norrie, CO.
Drainage Area and Period of Record.--	Drainage area is 9.43 mi ² . Station established at present site Oct. 1, 1975. Operated and maintained by State of Colorado Division of Water Resources since 1977.
Equipment.--	Sutron Model SDR-001-4 stage discharge recorder (SDR) housed in a 3'-0" square metal-clad shelter on 24" diameter corrugated metal well located directly in stream. The SDR is hard-wired to Chapman Control House and configured to transmit gage height via 4-20 mA output. SDR is set by drop tape to inside reference point.
Hydrologic Conditions.--	Basin is USFS land with several seasonal roads. Transmountain diversions occur just upstream of station and are diverted to Arkansas River Basin through Charles H. Boustead Tunnel.
Gage-Height Record.--	The primary record is 15-minute data downloaded from the SDR. Satellite transmitted data is used as backup when available. SDR data was used from Oct. 1, 2010 until 1415 on Sep. 6, 2011. Satellite telemetry data was used from 1430 on Sep. 6, 2011 until the end of the water year. The record is complete and reliable for Water Year 2011, except for Oct 26 - 30, and Nov 10, 2010 - Mar 30, 2011, when the stilling well and control were frozen. Minor instrument corrections were made throughout water year 2011.
Datum Corrections.--	Levels were run to the inside gage R.P. on Sep 1, 2011 using RM 3 as a base. The gage was found to read correct and no adjustment to the RP was made.
Rating.--	Low water control is 120 degree v-notch weir approximately 30 ft below gage. High water control is 8 ft diameter culvert and concrete headwall adjacent to weir. Rating No. 4 has been in use since October 1, 1996 was used for the entire water year. It is fairly well defined up to 108 cfs. Four discharge measurements (242-245) made during Water Year 2011. The measurements ranged from 0.78 to 3.61 cfs, which covered the daily discharge range experienced during the period of record except for lower daily flows on Oct 1-12, 14-22, 2010 and higher daily flows on May 6-7; Jun 4-30; Jul 1-11, 23-26; and Sep 3, 2011. The peak discharge of 138 cfs occurred at 2000 on Jul 9, 2011 at a gage height of 3.33 ft with a shift of 0.00 ft. The peak gage height exceeded high measurement 243 by 2.38 feet in stage.
Discharge.--	Shifting control method was used during the entire water year. Variable stage-shift curve IVCRNACOVS2011 was defined by measurement 242-245 and the two highest historic measurements (173 and 222). The shifts were applied using variable stage-shift curve IVCRNACOVS2011 for the entire water year. Shifts were not applicable for periods of no gage height. Discharge measurements indicate shifts ranged from -0.03 ft to -0.02 ft. All measurements were given full weight and applied directly except for measurement no. 242, 243, 244 and 245 which were discounted from -3% to 5% to smooth shift distribution.
Special Computations.--	Average daily discharge for days with no gage height record (Oct 26 –30 and Nov 10 – Mar 30) were estimated from hydrographic comparison with the downstream gage on the Fryingpan River near Thomasville (FRYTHOCO). Diversions associated with the Fryingpan-Arkansas project were not occurring during the estimated periods of record, which allows reasonable estimates of discharge using this method.
Remarks.--	Record is good except for periods of ice-affected gage height, which are poor. Due to lack of rating definition above 50 cfs as confirmed by recent high flow measurements, periods of mean daily flow above 50 cfs (including the peak flow) should be considered poor. Station maintained and record developed by Craig Bruner.
Recommendations.--	An adjustable R.P. needs to be installed in the equipment shelter. Make site visit(s) on snowmobiles or ATVs in April and/or May to evaluate ice condition in channel, control, and stilling well. Request that USBR record all gage visits and activity on station visit log. Determine stage-discharge break-points during level run. Run levels and refine stage-discharge rating.

STATE OF COLORADO
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09077610 IVANHOE CREEK NEAR NAST

RATING TABLE-- IVCRNAC004 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.76	1.3	e1.1	e1.2	e1.2	e1.5	2.3	2.4	2.7	58	2.3	1.6
2	0.73	1.2	e1.1	e1.2	e1.2	e1.5	2.5	2.2	3.5	52	2.3	3.2
3	0.73	1.3	e1.1	e1.3	e1.2	e1.5	3.0	2.2	3.1	37	2.3	9.7
4	0.73	1.4	e1.1	e1.2	e1.2	e1.5	2.8	2.3	5.2	19	2.2	3.0
5	0.73	1.4	e1.1	e1.1	e1.2	e1.6	2.7	2.8	12	23	2.2	1.5
6	0.73	1.5	e1.1	e1.0	e1.2	e1.6	2.6	4.0	24	29	2.2	1.3
7	0.76	1.6	e1.1	e1.0	e1.2	e1.6	2.0	5.0	19	21	2.1	e1.7
8	0.73	1.4	e1.0	e1.0	e1.3	e1.6	2.0	2.5	12	19	2.2	1.7
9	0.74	1.5	e1.2	e1.0	e1.3	e1.6	2.2	2.4	13	36	2.2	1.7
10	0.69	e1.1	e1.1	e1.1	e1.3	e1.6	2.0	2.2	10	26	2.2	1.4
11	0.74	e1.2	e1.0	e1.2	e1.3	e1.6	2.1	2.3	10	10	2.2	1.3
12	0.72	e1.1	e1.1	e1.3	e1.3	e1.6	2.3	2.5	9.9	2.9	2.2	1.2
13	0.78	e1.0	e1.1	e1.2	e1.3	e1.6	2.3	2.6	8.8	2.5	2.2	1.2
14	0.68	e1.2	e1.2	e1.1	e1.4	e1.6	2.4	2.5	18	2.5	2.3	1.3
15	0.66	e1.3	e1.2	e1.1	e1.4	e1.6	2.3	2.6	26	2.5	2.1	2.2
16	0.66	e1.3	e1.2	e1.0	e1.4	e1.6	2.2	2.5	32	2.4	2.2	2.0
17	0.66	e1.2	e1.1	e1.0	e1.4	e1.9	2.1	2.5	21	2.5	2.0	1.7
18	0.60	e1.2	e1.2	e1.0	e1.4	e2.0	2.1	2.5	22	2.5	1.8	1.8
19	0.64	e1.2	e1.2	e1.1	e1.4	e2.1	2.1	2.4	10	2.5	1.8	1.6
20	0.64	e1.3	e1.2	e1.1	e1.4	e2.2	2.3	2.5	4.9	2.5	1.8	1.5
21	0.62	e1.3	e1.3	e1.1	e1.4	e2.3	2.7	2.5	4.4	2.5	1.7	1.3
22	0.65	e1.2	e1.2	e1.1	e1.4	e2.4	2.7	2.5	14	2.9	1.7	1.2
23	0.91	e1.1	e1.2	e1.1	e1.4	e2.4	2.5	2.6	26	4.6	1.6	1.2
24	1.1	e1.2	e1.2	e1.1	e1.4	e2.4	2.4	2.6	39	7.4	1.5	1.2
25	1.3	e0.99	e1.1	e1.1	e1.4	e2.6	2.4	2.6	62	15	1.6	1.1
26	e1.0	e1.2	e1.2	e1.1	e1.4	e2.3	2.4	2.5	66	7.6	1.7	1.1
27	e1.0	e1.2	e1.3	e1.1	e1.4	e2.2	2.4	2.6	49	2.5	2.2	1.0
28	e0.96	e1.1	e1.2	e1.1	e1.4	e2.2	2.4	2.7	36	2.5	1.7	1.0
29	e1.3	e1.1	e1.1	e1.2	---	e2.2	2.6	3.1	53	2.4	2.6	0.99
30	e1.4	e1.1	e1.2	e1.2	---	e2.3	2.5	2.6	72	2.3	2.1	0.97
31	1.4	---	e1.1	e1.2	---	2.2	---	2.5	---	2.3	1.7	---
TOTAL	25.75	37.19	35.6	34.6	37.2	58.9	71.3	81.7	688.5	404.8	62.9	53.66
MEAN	0.83	1.24	1.15	1.12	1.33	1.90	2.38	2.64	23.0	13.1	2.03	1.79
AC-FT	51	74	71	69	74	117	141	162	1370	803	125	106
MAX	1.4	1.6	1.3	1.3	1.4	2.6	3.0	5.0	72	58	2.6	9.7
MIN	0.60	0.99	1.0	1.0	1.2	1.5	2.0	2.2	2.7	2.3	1.5	0.97

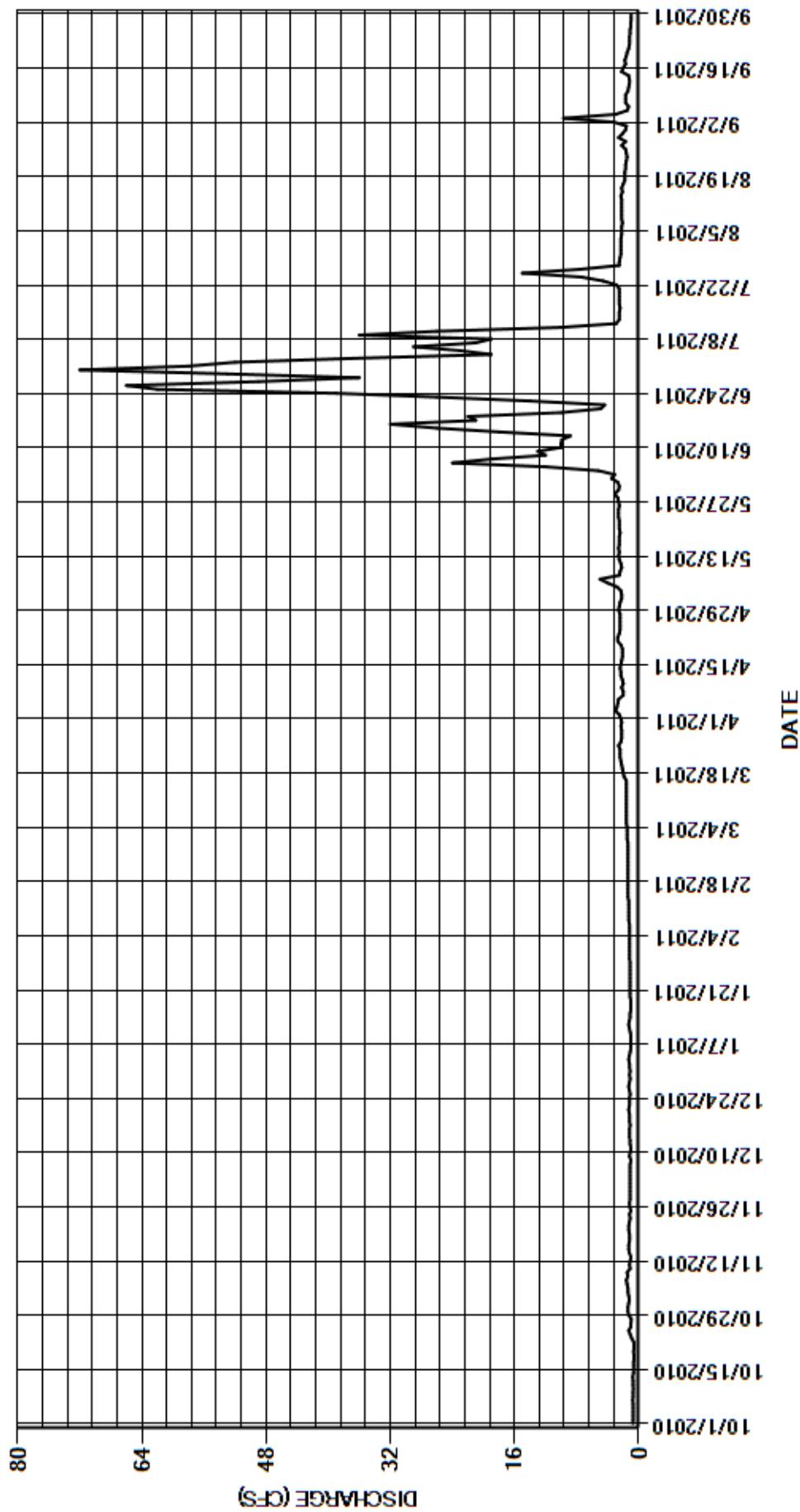
CAL YR	2010	TOTAL	1053.72	MEAN	2.89	MAX	96	MIN	0.60	AC-FT	2090
WTR YR	2011	TOTAL	1592.10	MEAN	4.36	MAX	72	MIN	0.60	AC-FT	3160

MAX DISCH: 138 CFS AT 20:00 ON JUL 09,2011 GH 3.33 FT SHIFT 0 FT

MAX GH: 3.33 FT AT 20:00 ON JUL 09,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09077610 IVANHOE CREEK NEAR NAST
WY2011 HYDROGRAPH



ROARING FORK RIVER BASIN
09077800 SOUTH FORK FRYINGPAN RIVER AT UPPER STATION NEAR NORRIE
Water Year 2011

Location.--	Lat. 39°14'20", Long. 106°35'24", unsurveyed, Pitkin County, Hydrologic Unit 14010004, on right bank 300 ft downstream from diversion dam, 5.2 mi upstream from mouth, and 7.2 mi southeast of Norrie, CO.
Drainage Area and Period of Record.--	11.5 mi ² . Station established Oct. 1, 1963 at a location 0.2 miles downstream at a different datum. Moved to present site and datum Oct. 1, 1973. Operated and maintained by State of Colorado Division of Water Resources since 1977.
Equipment.--	Sutron Model SDR-0001-4 stage discharge recorder (SDR) on rectangular platform with removable steel cover on 12-in diameter corrugated metal well located directly in stream (replaced on Sep 9, 2011). The SDR is hard-wired to Chapman Control House and configured to transmit 4-20 mA gage height via satellite. SDR is set by drop tape to a reference point (1/4 in brass bolt) on outside of downstream side of shelter previously used for a graphic recorder.
Hydrologic Conditions.--	Drainage Basin is National Forest land, primarily wilderness area. Transmountain diversions occur just upstream of station and are diverted to Arkansas River Basin through Charles H. Bousted Tunnel.
Gage-Height Record.--	The primary record is 15-minute data downloaded from the SDR. Satellite transmitted data is used as backup when available. The record is complete and reliable for Water Year 2011, except for the periods Oct 26 - 29 and Nov 11, 2010 - Apr 11, 2011 when the gage stilling well was frozen; and Sep 6-9, 2011 when the SDR malfunctioned.
Datum Corrections.--	Levels were run to outside gage RP on Sep 1, 2011. Using RM 2 as a base, the gage was found to read correct. An RP adjustment was not required.
Rating.--	Control is 6.2 ft wide sharp crested concrete weir with a 6 ft concrete apron above the crest. Rating No. 9 has been in use since May 2, 2005 and is reasonably well-defined from 5 to 115 cfs. Five discharge measurements (348-352) made during Water Year 2011, and measurement 353 made subsequently, were used for analysis. Measurements range in discharge from 6.05 to 87 cfs, and covered the range experienced during the period of record except for lower daily flows on Oct 1-6, 14-23, 25-31; Nov 1-3, 5, 8-9, 13, 22-30; Dec 1-31; Jan 1-31; Feb 1-28; Mar 1-31; Apr 1-7, 11, 15-30; May 1-18; and Aug 6-10. The peak discharge of 194 cfs occurred at 1930 on Jul 5, 2011 at a gage height of 4.97 ft. with a shift of +0.07 ft. The peak discharge exceeded high Measurement No. 351 by 1.09 ft in stage. High Measurements 350 and 351 were facilitated by the USBR opening the diversion bypass gate to create high flow conditions for refining the stage-discharge relationship.
Discharge.--	Shifting section control method was used for all of Water Year 2011. Shifts were applied and distributed by time from the beginning of the water year until the well froze. Variable stage-shift curve FRYSFUCOVS2011 was defined by measurements 349-353 and historic high measurement 297. Shifts were distributed by stage using variable shift curve FRYSFUCOVS2011 from the day of well thaw on Apr 12, 2011 through the end of water year 2011. Measurements indicate raw shifts ranging from +0.01 ft to +0.08 ft. Measurements 350, 351, 352 and 353 were discounted from -2% to +5% to smooth the shift distribution.
Special Computations.--	Discharge for days with no gage height record were estimated by hydrographic comparison with downstream gage on Fryingpan River near Thomasville (FRYTHOCO). Discharge for the period of SDR malfunction (Sep 6-9) were estimated using good data before and after the malfunction. Diversions associated with the Fryingpan-Arkansas Project were not occurring during the estimated periods of record, which allows reasonable estimates of discharge using this method.
Remarks.--	Record is good, except for periods of no gage height record which are estimated and considered poor. Station maintained by Craig Bruner. Record developed by Craig Bruner and James Kellogg.
Recommendations.--	Make site visit on snow mobiles or ATVs in April May (depending on avalanche hazard at mile marker 9 on road) to evaluate ice condition in channel, control, and stilling well. Monitor diversions for intermediate stage flow measurement opportunity.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09077800 SOUTH FORK FRYINGPAN RIVER AT UPPER STATION NEAR NORRIE

RATING TABLE-- FRYSFUC009 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.4	3.1	e4.9	e3.9	e3.0	e2.8	e3.2	4.3	7.9	44	6.7	16
2	5.1	3.3	e4.9	e4.0	e3.0	e2.7	e4.1	4.2	8.1	40	6.7	15
3	5.0	4.8	e4.9	e4.2	e3.0	e2.7	e6.0	4.2	7.7	27	6.4	14
4	5.0	6.2	e4.8	e3.7	e3.0	e2.8	e5.5	4.2	7.7	36	6.3	14
5	5.0	6.0	e4.8	e3.6	e3.0	e2.8	e5.1	5.0	7.7	40	6.5	13
6	5.5	6.1	e4.8	e3.3	e2.9	e2.8	e5.9	5.8	12	21	5.9	e13
7	7.0	6.1	e4.7	e3.3	e2.9	e2.8	e5.7	5.9	10	28	5.9	e13
8	7.7	5.8	e4.2	e3.3	e2.9	e2.8	e6.2	4.3	9.1	27	6.0	e12
9	6.7	5.6	e4.8	e3.2	e2.9	e2.8	e6.7	4.1	8.7	52	5.9	e13
10	6.5	6.5	e4.6	e3.2	e2.9	e2.8	e6.5	4.1	10	6.0	5.9	12
11	6.4	e7.0	e4.3	e3.5	e3.0	e2.7	e5.8	3.9	12	16	8.4	12
12	6.8	e6.2	e4.4	e3.8	e3.0	e2.7	6.2	3.9	11	6.8	9.9	12
13	6.4	e5.8	e4.6	e3.6	e3.0	e2.7	6.2	3.8	12	6.5	13	11
14	6.0	e6.9	e4.7	e3.2	e2.9	e2.7	6.1	3.7	13	6.6	18	12
15	5.6	e6.8	e4.6	e3.1	e2.9	e2.7	5.9	3.5	21	6.5	20	14
16	5.4	e6.8	e4.5	e3.0	e2.9	e2.7	5.7	3.5	41	6.5	19	13
17	5.3	e6.3	e4.1	e3.0	e2.9	e3.1	5.7	3.3	23	6.6	19	13
18	5.3	e6.1	e4.4	e3.0	e2.9	e3.2	5.8	4.5	16	6.6	19	12
19	5.6	e6.4	e4.4	e3.0	e2.9	e3.3	5.7	7.0	18	14	19	11
20	5.3	e6.6	e4.5	e2.9	e2.9	e3.4	5.5	7.0	9.6	6.5	19	10
21	5.2	e6.5	e4.8	e3.1	e2.9	e3.5	5.8	7.0	8.4	6.6	19	10
22	5.6	e5.8	e4.6	e3.0	e2.8	e3.8	5.6	7.1	13	6.5	18	9.6
23	5.8	e5.6	e4.4	e2.9	e2.8	e3.6	5.3	7.1	31	6.5	17	9.3
24	6.1	e5.7	e4.3	e3.0	e2.8	e3.6	5.1	7.3	54	6.5	17	9.0
25	6.0	e4.8	e4.0	e2.9	e2.8	e3.8	4.9	7.3	59	6.5	20	8.8
26	e3.9	e5.6	e4.2	e2.9	e2.8	e3.4	4.7	7.3	51	6.5	26	8.5
27	e3.3	e5.6	e4.6	e2.8	e2.8	e3.2	5.5	7.4	45	6.5	25	8.3
28	e2.6	e5.4	e4.3	e2.8	e2.8	e3.1	6.0	10	47	6.5	20	8.1
29	e3.0	e5.2	e3.9	e3.1	---	e3.1	4.8	11	56	6.5	21	8.0
30	2.7	e5.0	e4.0	e3.0	---	e3.2	5.4	7.8	77	6.5	19	7.9
31	2.7	---	e3.8	e3.0	---	e3.1	---	7.6	---	6.6	17	---
TOTAL	163.9	173.6	138.8	100.3	81.3	94.4	166.6	177.1	706.9	475.3	445.5	342.5
MEAN	5.29	5.79	4.48	3.24	2.90	3.05	5.55	5.71	23.6	15.3	14.4	11.4
AC-FT	325	344	275	199	161	187	330	351	1400	943	884	679
MAX	7.7	7.0	4.9	4.2	3.0	3.8	6.7	11	77	52	26	16
MIN	2.6	3.1	3.8	2.8	2.8	2.7	3.2	3.3	7.7	6.0	5.9	7.9

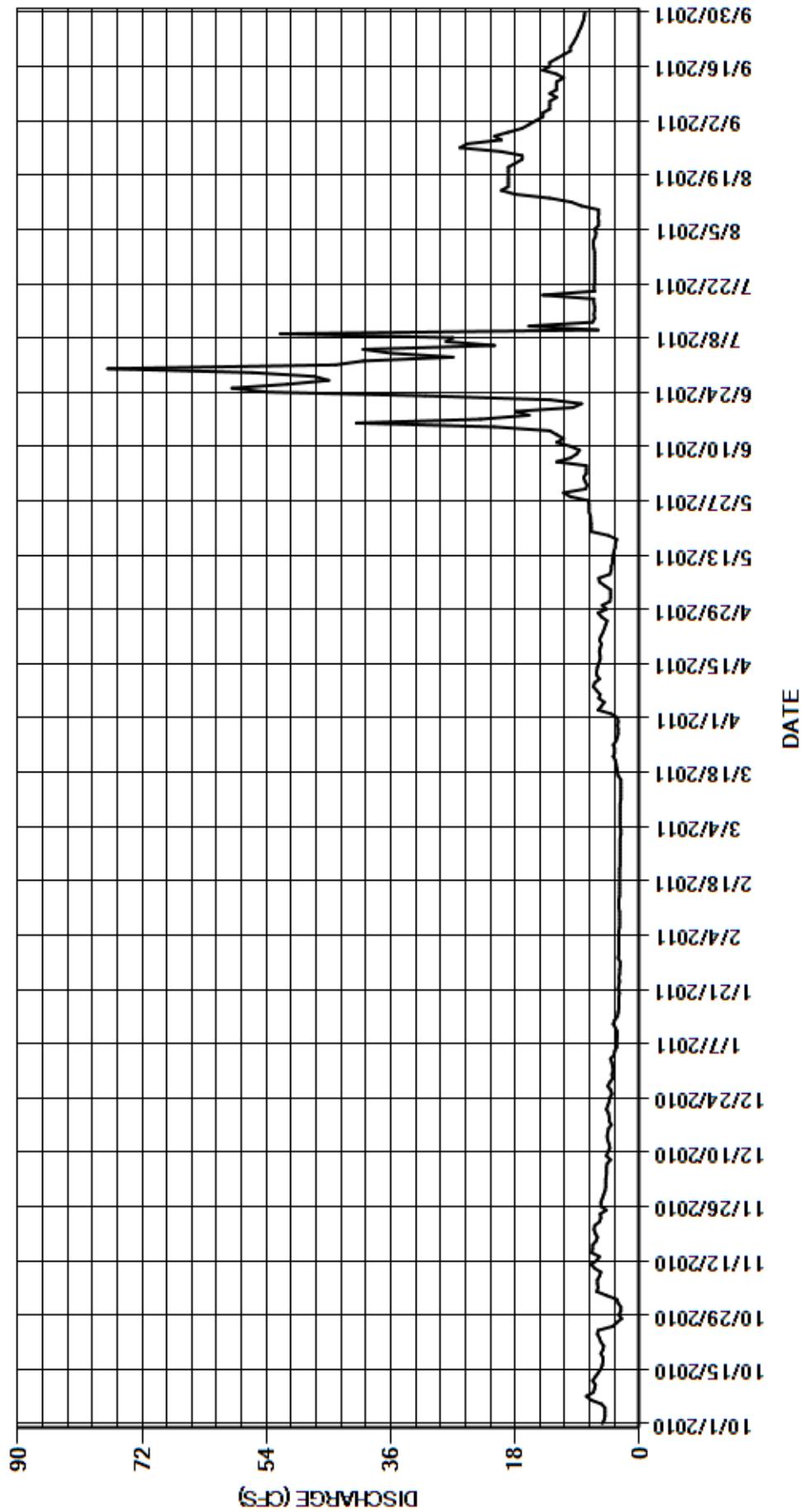
CAL YR	2010	TOTAL	3110.1	MEAN	8.52	MAX	86	MIN	1.1	AC-FT	6170
WTR YR	2011	TOTAL	3066.2	MEAN	8.40	MAX	77	MIN	2.6	AC-FT	6080

MAX DISCH: 194 CFS AT 19:30 ON JUL 05,2011 GH 4.97 FT SHIFT 0.07 FT

MAX GH: 4.97 FT AT 19:30 ON JUL 05,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09077800 SOUTHFORK FRYINGPAN RIVER AT UPPER STATION NEAR NORRIE
WY2011 HYDROGRAPH



ROARING FORK RIVER BASIN
09077945 CHAPMAN GULCH NEAR NAST
Water Year 2011

Location.--	Lat. 39°15'51", long. 106°37'54", in NW 1/4 of SE 1/4 of Sec. 14, T8S, R83W in Pitkin County, on right bank 700 ft downstream from Chapman diversion tunnel, 3.3 mi upstream from confluence with Fryingpan River, and 4.3 mi southeast of Norrie, CO.
Drainage Area and Period of Record.--	Approximately 6 mi ² from topographic map. Established Oct 1, 1966 at site 0.3 mi. downstream from present site. Gage moved to present site on Oct 19, 1972. Colorado Division of Water Resources has operated and maintained gage since July 1977.
Equipment.--	Sutron model SDR-0001-4 stage discharge recorder in 3 feet square metal-clad shelter on a 24 inch diameter corrugated metal well located directly in stream. SDR is set to an inside reference point with a drop tape. SDR is hard-wired to Chapman Control House and configured to transmit gage height via 4-20 mA output. A graphic water-stage recorder was removed from the shelter at the end of Water Year 2010.
Hydrologic Conditions.--	Basin is almost entirely roadless National Forest land. Chapman Diversion for Fryingpan-Arkansas Project is just upstream of gaging station. Hunter Tunnel discharges above the diversion. During winter, ground water seepage from the tunnel flows into the stream and keeps control and gaging station free of ice.
Gage-Height Record.--	The primary record is 15-minute data downloaded from the SDR with satellite transmitted data used as backup. The record is complete and reliable for Water Year 2011 except for Nov 23-28; Dec 31, 2010; Jan 1-5, 10-12; and Feb 1-4, 9-11, 2011 when the stilling well was frozen. Several instrument corrections were made to the SDR during the period of record. The float tape accidentally slipped from the shaft encoder wheel resulting in 5 erroneous unit gage height values being recorded on June 5, 2011. These were corrected in the record without loss of accuracy.
Datum Corrections.--	Levels were run to inside gage on Sep 13, 2011. Using RM 1 as a base, the gage was found to read 0.01 ft high, which is within accepted tolerance. The RP was not adjusted.
Rating.--	Low water control is 120-degree (v-notch) weir approximately 12 ft below gage. High water control is the channel banks. Rating 7 was applied from the beginning of the water year until Oct 13, 2010. Rating 8 was developed on Nov 17, 2011 to refine the upper end of the stage-discharge relationship using high flow Measurements 387 and 388. The new rating is well defined from about 1.0 to 100 cfs and was applied from Oct 13, 2010 through the remainder of the water year. Nine discharge measurements (Nos. 381-389) were made during WY 2011. Measurement 390 made subsequently was also used for analysis. Bypass gate on the diversion dam was opened to facilitate high flow conditions for Measurements 387 and 388. Measurements ranged from 1.55 to 74.3 cfs and cover the range of flow experienced during the year except for lower daily flows on Jan 24-31; Feb 1-28; Mar 1-31; and Apr 1-9, 2011. The peak instantaneous flow of 195 cfs occurred at 2045 on Jul 19, 2011 at a gage height of 4.40 ft with a shift of 0.00 ft. Peak gage height exceeded high flow Measurement 388 by 0.86 ft in stage.
Discharge.--	Shifting section control method was used for WY 2011. Shifts were applied and distributed by time for the entire period of record. Measurement shifts ranged from -0.05 ft to +0.03 ft. Measurements 384, 387, 388 and 389 were discounted -6% to +3% to smooth the shift distribution.
Special Computations.--	Discharge for days with frozen well were estimated with straight line interpolation. Intermittent discharge of water diverted from other stream basins in the collection system makes it difficult to estimate gage height from comparison with FRYTHOCO when the Fry-Ark system is in operating in spring and summer months.
Remarks.--	Record is rated good with the periods when the well was frozen rated fair. Gaging station operated by James Kellogg and Craig Bruner. Record developed by James Kellogg.
Recommendations.--	None for WY 2012.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09077945 CHAPMAN GULCH NEAR NAST

RATING TABLE-- CHAGULCO07 USED FROM 01-OCT-2010 TO 13-OCT-2010
CHAGULCO08 USED FROM 13-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.7	2.9	2.3	e2.0	e1.5	1.5	1.5	2.1	3.5	4.0	3.6	7.6
2	2.7	2.8	2.3	e1.9	e1.5	1.5	1.6	2.0	5.2	7.4	3.4	7.2
3	2.6	2.9	2.3	e1.9	e1.5	1.5	1.6	2.0	2.9	5.2	3.4	6.9
4	2.6	2.8	2.3	e1.8	e1.5	1.5	1.5	2.2	6.6	15	3.4	6.3
5	2.6	2.8	2.3	e1.8	1.5	1.5	1.5	2.7	27	14	3.5	5.9
6	2.6	2.8	2.3	1.8	1.5	1.5	1.6	3.4	23	3.7	4.0	7.3
7	3.0	2.8	2.2	1.8	1.5	1.5	1.5	3.9	18	3.8	4.0	8.0
8	3.6	2.7	2.1	1.8	1.5	1.5	1.6	3.3	21	4.4	3.9	8.0
9	3.2	2.7	2.1	1.8	e1.5	1.4	1.6	3.0	4.2	11	3.9	6.6
10	3.2	2.5	2.1	e1.8	e1.5	1.4	1.7	3.0	5.6	4.6	3.9	6.0
11	3.1	2.6	2.1	e1.8	e1.5	1.5	1.9	3.0	6.9	3.3	4.0	5.7
12	3.3	2.5	2.1	e1.8	1.5	1.5	2.1	3.0	15	8.3	3.9	5.5
13	3.0	2.5	2.1	1.8	1.5	1.4	2.0	3.0	16	14	3.9	5.3
14	2.8	2.5	2.1	1.7	1.5	1.4	2.0	3.1	9.4	2.7	5.0	5.5
15	2.7	2.5	2.1	1.7	1.5	1.4	2.0	3.1	8.2	3.5	5.5	6.8
16	2.6	2.5	2.1	1.7	1.5	1.5	2.0	3.1	14	3.7	5.5	6.4
17	2.6	2.5	2.0	1.7	1.5	1.5	2.1	3.0	3.6	3.3	5.5	6.3
18	2.6	2.4	2.0	1.7	1.5	1.5	2.2	3.0	10	3.8	7.7	5.8
19	2.6	2.5	2.1	1.7	1.5	1.5	2.3	3.1	9.6	21	10	5.0
20	2.5	2.5	2.1	1.7	1.5	1.4	2.3	3.2	4.4	3.5	10	4.7
21	2.5	2.5	2.0	1.7	1.5	1.4	2.5	3.4	7.8	3.9	10	4.5
22	2.7	2.4	2.0	1.7	1.5	1.5	2.4	3.4	11	4.0	9.8	4.3
23	2.9	e2.4	2.0	1.7	1.5	1.4	2.3	3.4	7.8	4.2	8.4	4.1
24	2.9	e2.4	2.0	1.6	1.5	1.5	2.2	3.4	14	3.9	7.6	4.0
25	2.9	e2.4	2.0	1.6	1.5	1.4	2.1	3.5	4.0	3.9	14	3.9
26	3.0	e2.3	2.0	1.6	1.5	1.4	2.2	3.5	9.5	3.8	13	3.8
27	3.0	e2.3	2.0	1.6	1.5	1.4	2.1	3.7	18	3.9	12	3.7
28	3.0	e2.3	2.0	1.6	1.5	1.4	2.1	3.9	17	3.7	9.2	3.6
29	3.1	2.3	2.0	1.6	---	1.4	2.3	3.5	21	3.7	11	3.5
30	3.1	2.3	2.0	1.6	---	1.4	2.2	3.6	17	3.6	9.3	3.5
31	3.0	---	e2.0	1.6	---	1.4	---	3.7	---	3.6	8.1	---
TOTAL	88.7	76.3	65.1	53.6	42.0	45.0	59.0	97.2	341.2	182.4	210.4	165.7
MEAN	2.86	2.54	2.10	1.73	1.50	1.45	1.97	3.14	11.4	5.88	6.79	5.52
AC-FT	176	151	129	106	83	89	117	193	677	362	417	329
MAX	3.6	2.9	2.3	2.0	1.5	1.5	2.5	3.9	27	21	14	8.0
MIN	2.5	2.3	2.0	1.6	1.5	1.4	1.5	2.0	2.9	2.7	3.4	3.5

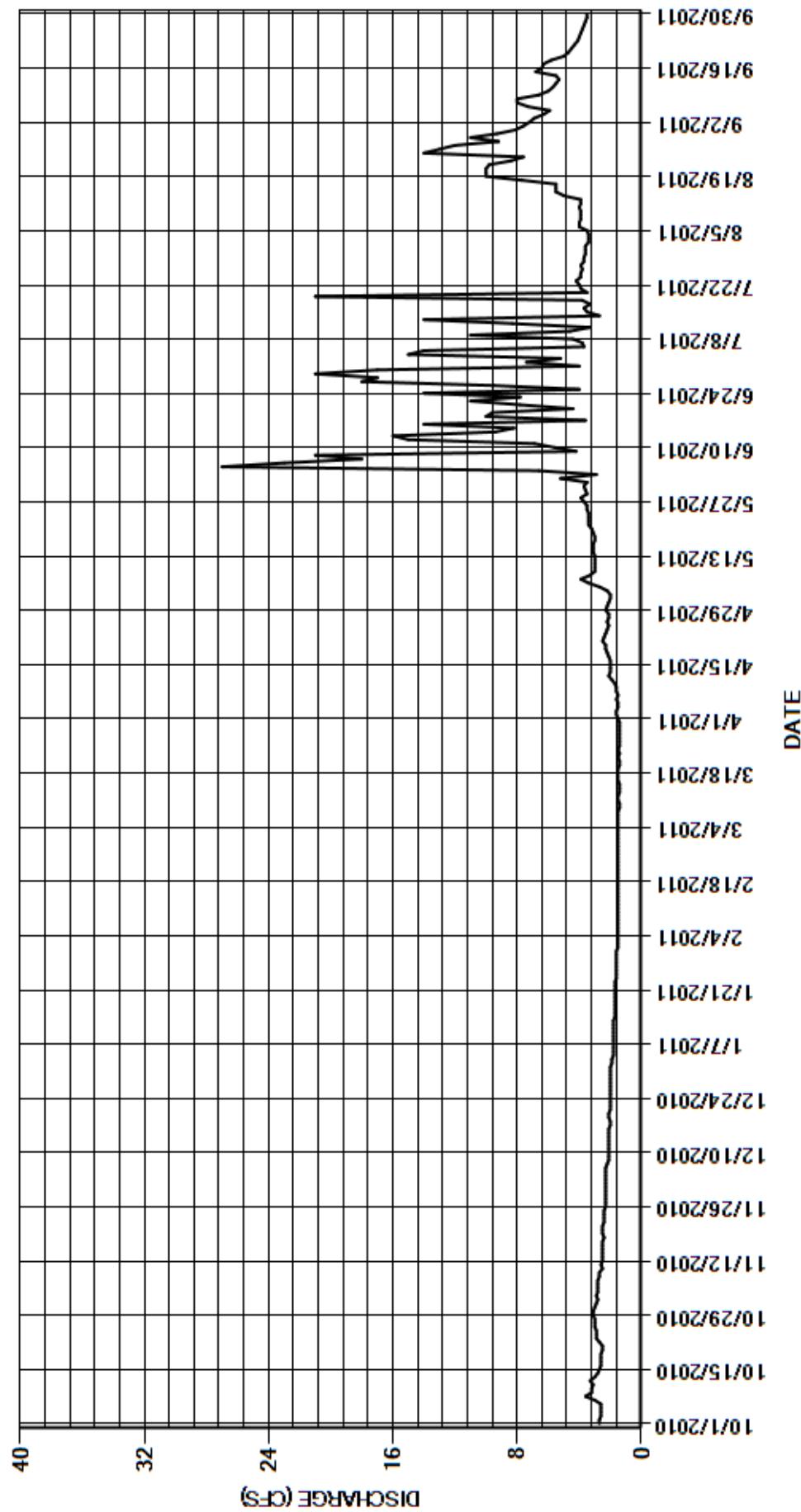
CAL YR	2010	TOTAL	1617.1	MEAN	4.43	MAX	56	MIN	1.1	AC-FT	3210
WTR YR	2011	TOTAL	1426.6	MEAN	3.91	MAX	27	MIN	1.4	AC-FT	2830

MAX DISCH: 195 CFS AT 20:45 ON JUL 19,2011 GH 4.40 FT SHIFT 0 FT

MAX GH: 4.40 FT AT 20:45 ON JUL 19,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09077945 CHAPMAN GULCH NEAR NAST
WY2011 HYDROGRAPH



ROARING FORK RIVER BASIN
09078500 NORTH FORK FRYINGPAN RIVER NEAR NORRIE
Water Year 2011

Location.--	Lat. 39°20'34", Long. 106°39'55", in SE $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 21, T8S, R83W in Pitkin County (Hydrologic Unit 14010004). Located on left bank of North Fork of Fryingpan River, 800 ft upstream from bridge on county road, 0.4 mi upstream of confluence with Fryingpan River, 0.5 mi downstream from Last Chance Creek, and 1.3 mi northwest of Norrie, CO.
Drainage Area and Period of Record.--	42 mi 2 .
Equipment.--	Sutron Model 56-0540 shaft encoder (SE) and Sutron SatLink 2 data collection platform housed in a 42-in diameter corrugated metal shelter and stilling well. A Stevens A-35 graphic water-stage recorder is also located inside shelter. An air temperature sensor is mounted on exterior of the shelter. Shaft encoder and graphic recorder are equipped with separate floats and set by drop tape to an adjustable reference point on edge of recorder shelf.
Hydrologic Conditions.--	Basin is primarily USFS land. Diversions for the Fryingpan-Arkansas Project occur in several tributaries upstream of the station. Well and intakes are frozen in winter.
Gage-Height Record.--	The primary record is 15-minute shaft encoder data transmitted by satellite. Chart recorder data is used for backup. The record is complete and reliable, except for the period of Nov 14, 2010 through Apr 17, 2011 and Apr 30 through May 5, 2011 when the well was frozen. The control was ice-affected on Nov 13, 2010. Minor instrument corrections were made at several times during the period of record.
Datum Corrections.--	Levels were run Aug 24, 2011 to the inside gage reference point (RP) using R.M. 3 as base. The gage was found to read -0.003 ft low, which is within tolerable limits. Accordingly, the RP was not adjusted.
Rating.--	Control is channel and large boulder 50 feet downstream of gage. Rating 11 (developed in WY2010) was used for the entire period of water year 2011. Seven discharge measurements (818-824) made during WY2011, and measurement 825 made subsequently, were used for analysis. The measurements ranged in discharge from 4.15 to 72.4 cfs and cover the range of discharge experienced during the period of record except for the lower daily flows of Oct 1-7, 2010 and the higher daily flows of May 8-11, 14-20, 23-31; Jun 1-30; and Jul 1-14, 2011. The peak discharge of 358 cfs occurred at 0215 on Jun 7, 2011 at a gage height of 4.55 ft with a shift of 0.00 ft. It exceeded the stage of Measurement No. 823 by 1.13 ft.
Discharge.--	Shifts were distributed by time up to the period of ice-affected gage height . No shift was applied during periods of ice effect. Variable stage-shift relationship FRYNFNCOVS2011 was developed considering measurements 822-824 and historical measurement data. Shifts were distributed by stage from Apr 18 - 29, 2011 and May 6 to 0245 Sep 18, 2011. Shifts were then applied by time proration from 0300 Sep 18 to 1545 Oct 5, 2011. Measurement shifts ranged from -0.03 to +0.05 ft. Measurements 818 and 822 were discounted -3% and +3%, respectively to smooth the shift distribution and develop the variable stage-shift curve. Measurements 819 - 821 were made during the period of no gage height when the stilling well was frozen.
Special Computations.--	Average daily discharge for period of ice-affected gage height and frozen well were estimated by hydrographic comparison with WY2011 record from downstream gage on the Fryingpan River near Thomasville.
Remarks.--	Record is rated good, except for periods when gage height was ice affected and stilling well was frozen, which are estimated and rated poor. Days with average daily flows greater than 180 cfs (twice the highest measurement of 90 cfs made in WY 2010) should be considered poor. Station maintained and record developed by Craig Bruner.
Recommendations.--	Levels run on Aug 14, 2011 indentified a break-point in stage-discharge rating FRYNFNCO11 at gage height of 2.15 ft. Need to run levels again in WY2012 to potentially identify additional rating break-points between gage heights of 2.15 and 3.20 ft. Also should attempt to make as many measurements as possible in this gage height range. If adequate data can be obtained, a new stage-discharge rating can likely be developed.

STATE OF COLORADO
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09078500 NORTH FORK FRYINGPAN RIVER NEAR NORRIE

RATING TABLE-- FRYNFNCO11 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

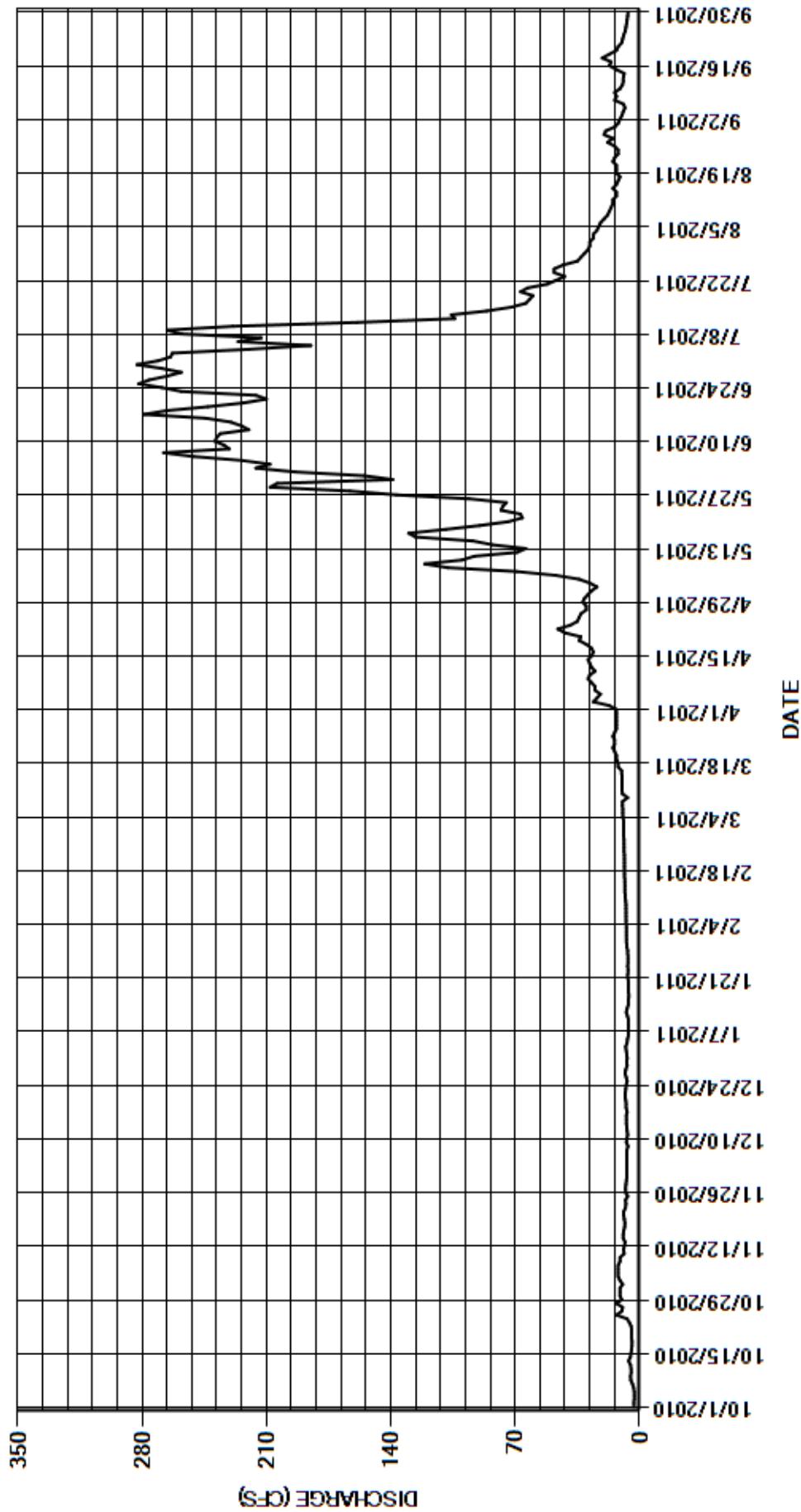
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.2	11	e7.2	e7.2	e7.4	e9.0	e13	e29	155	271	28	12
2	3.2	9.5	e7.2	e7.5	e7.4	e9.0	e17	e27	194	264	26	11
3	3.0	11	e7.2	e7.8	e7.4	e9.0	e26	e24	216	263	26	10
4	3.0	12	e7.2	e7.0	e7.5	e9.4	e24	e28	208	220	24	9.2
5	3.0	12	e7.2	e6.8	e7.5	e9.5	e22	e34	224	185	23	8.2
6	3.3	12	e7.2	e6.2	e7.6	e9.5	e25	47	251	226	22	9.1
7	4.0	12	e7.2	e6.2	e7.6	e9.6	e25	69	268	213	20	14
8	4.9	11	e6.5	e6.2	e7.7	e9.6	e27	108	231	258	18	13
9	5.1	11	e7.4	e6.2	e7.7	e6.7	e29	121	234	266	17	14
10	4.7	8.7	e7.2	e6.2	e7.8	e9.7	e28	100	239	229	16	11
11	4.8	9.0	e6.7	e6.8	e8.1	e9.8	e25	93	238	159	15	9.6
12	5.1	e8.6	e7.0	e7.5	e8.2	e9.8	e27	69	236	104	15	9.1
13	6.2	e8.1	e7.2	e7.0	e8.2	e9.9	e28	64	220	106	13	9.1
14	5.2	e9.2	e7.4	e6.3	e8.2	e9.9	e29	83	224	86	13	8.6
15	4.8	e9.2	e7.4	e6.3	e8.3	e10	e27	94	230	72	15	13
16	4.5	e8.9	e7.5	e6.1	e8.4	e10	e26	126	244	64	13	17
17	4.3	e8.4	e7.0	e6.2	e8.4	e12	e27	130	279	62	12	16
18	4.2	e8.2	e7.5	e6.2	e8.4	e12	30	109	266	60	11	21
19	4.5	e8.6	e7.5	e6.2	e8.5	e13	34	90	243	67	13	17
20	4.6	e8.9	e7.8	e6.3	e8.5	e13	33	74	223	63	13	13
21	4.4	e8.9	e8.2	e6.6	e8.6	e14	42	66	210	52	13	12
22	4.7	e7.9	e8.0	e6.6	e8.6	e15	46	67	216	47	15	10
23	5.7	e7.7	e7.8	e6.4	e8.7	e14	39	78	258	42	14	9.5
24	7.0	e7.9	e7.5	e6.7	e8.7	e14	35	77	269	48	12	8.9
25	13	e6.7	e7.0	e6.5	e8.8	e15	34	75	282	48	12	8.1
26	10	e7.9	e7.5	e6.5	e8.8	e14	33	96	276	43	14	7.7
27	9.5	e7.9	e8.2	e6.6	e8.9	e13	30	137	266	35	18	7.3
28	13	e7.7	e7.8	e6.6	e8.9	e13	30	163	258	33	15	7.0
29	10	e7.4	e7.0	e7.2	---	e13	32	208	269	31	20	6.7
30	11	e7.2	e7.2	e7.3	---	e13	e31	204	283	29	19	6.5
31	11	---	e7.0	e7.3	---	e13	---	139	---	28	14	---
TOTAL	184.9	274.5	227.7	206.5	228.8	351.4	874	2829	7210	3674	519	328.6
MEAN	5.96	9.15	7.35	6.66	8.17	11.3	29.1	91.3	240	119	16.7	11.0
AC-FT	367	544	452	410	454	697	1730	5610	14300	7290	1030	652
MAX	13	12	8.2	7.8	8.9	15	46	208	283	271	28	21
MIN	3.0	6.7	6.5	6.1	7.4	6.7	13	24	155	28	11	6.5
CAL YR	2010	TOTAL	10086.2	MEAN	27.6	MAX	414	MIN	2.9	AC-FT	20010	
WTR YR	2011	TOTAL	16908.4	MEAN	46.3	MAX	283	MIN	3.0	AC-FT	33540	

MAX DISCH: 358 CFS AT 02:15 ON JUN 07,2011 GH 4.55 FT SHIFT 0 FT

MAX GH: 4.55 FT AT 02:15 ON JUN 07,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09078500 NORTHFORK FRYINGPAN RIVER NEAR NORRIE
WY2011 HYDROGRAPH



ROARING FORK RIVER BASIN
09078600 FRYINGPAN RIVER NEAR THOMASVILLE
Water Year 2011

Location.--	Lat. 39°20'41", Long. 106°40'23", in NW 1/4 NW 1/4 sec. 21, T.8 S., R.83 W., Pitkin County, Hydrologic Unit 14010004, on right bank 400 ft upstream from private bridge, 400 ft downstream from mouth of North Fork Fryingpan River, 1.6 mi southeast of Thomasville, CO, and 1.7 mi northwest of Norrie, CO.
Drainage Area and Period of Record.--	Drainage area is 134 mi ² . Gage established Oct 1, 1975. Colorado Division of Water Resources began gage operation of gage in water year 1977. Published streamflow record from Oct 1, 1975 to present.
Equipment.--	Sutron SE8500 shaft encoder and Stevens graphic water-stage recorder in 42" diameter corrugated metal shelter and stilling well. A Sutron SatLink data collection platform (DCP) is installed in box mounted on exterior of shelter. Recorder and shaft encoder have separate floats and are set by drop tape to an adjustable reference point on edge of equipment shelf in shelter. Stilling well is connected to stream by two, 2-in diameter pipes.
Hydrologic Conditions.--	Drainage basin is almost entirely National Forest land. Transmountain diversions above gage occur through Boustead Tunnel and through Busk-Ivanhoe Tunnel.
Gage-Height Record.--	The primary record is 15-minute satellite-transmitted shaft encoder data with chart record used for backup. The record is complete and reliable for Water Year 2011, except for the period Jan 30 through Mar 15, 2011 when the stilling well and/or intake pipes were frozen and the period Jul 13-15, 2011 when the intake pipes were clogged. Chart record was used on Jun 25, 2011 when the SDR float appeared to be temporarily stuck without loss of accuracy. Checks between the primary and backup records generally agreed to within +/- 0.02 ft. Several instrument corrections were applied during the period of record.
Datum Corrections.--	Levels were run to inside gage on Sep 14, 2011 using RM 1 as a base. The gage was found to read correct and the RP was not adjusted.
Rating.--	Control is a 100 ft long concrete weir. Rating No. 3 (developed Nov 18, 2008) was used for the entire Water Year 2011. The rating is well defined from 20 to 1000 cfs. Eight discharge measurements (Nos. 414-421) made during WY 2011, and No. 422 made subsequently, were used for analysis. Measurements ranged from 26.2 to 806 cfs, which covered the range experienced during the year except for the lower daily flows on Oct 2-5, 2010; Jan 6-10, 14-31, 2011; and Feb 1-10, 2011 and the higher daily flows on Jun 7, 16, 17, 24-26 and 29-30, 2011. The peak discharge of 1160 cfs occurred at 0100 on Jun 25, 2011 at a gage height of 4.12 ft and a shift of 0.00 ft. Chart record was used on this day because the SDR float appeared to be temporarily stuck. The peak gage height exceeded high Measurement No. 419 by 0.49 ft in stage.
Discharge.--	Shifting control method was used for the entire water year. Shifts were distributed by time from 00:0 Oct 1, 2010 through 1230 Apr 2, 2011. Shifts were applied using variable stage-shift relationship FRYTHOCOVS2012 from 1245 Apr 2 through the end of the water year. Measurements showed shifts ranged from -0.03 to +0.06 ft. Measurements 414, 415, 417, 419 and 422 were discounted from -4% to +6% to smooth the shift distribution and develop the variable stage-shift relationship FRYTHOCOVS2012.
Special Computations.--	Daily discharge for Jan 30 - Mar 15, 2011 (well and/or intakes frozen) was estimated by straight-line pro-ration using adjacent good gage height data. Daily discharge estimates for Jul 13-15, 2011 (intakes clogged) were made by hydrographic comparison to downstream FRYMERCO gage.
Remarks.--	Record is rated good, except for periods when well was frozen and intakes were plugged, which are rated poor. Gage operated by James Kellogg and Craig Bruner. Record developed by James Kellogg.
Recommendations.--	Extend constant flow bubbler orifice pipe closer to center of concrete weir control.

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09078600 FRYINGPAN RIVER NEAR THOMASVILLE

RATING TABLE.-- FRYTHOCO03 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

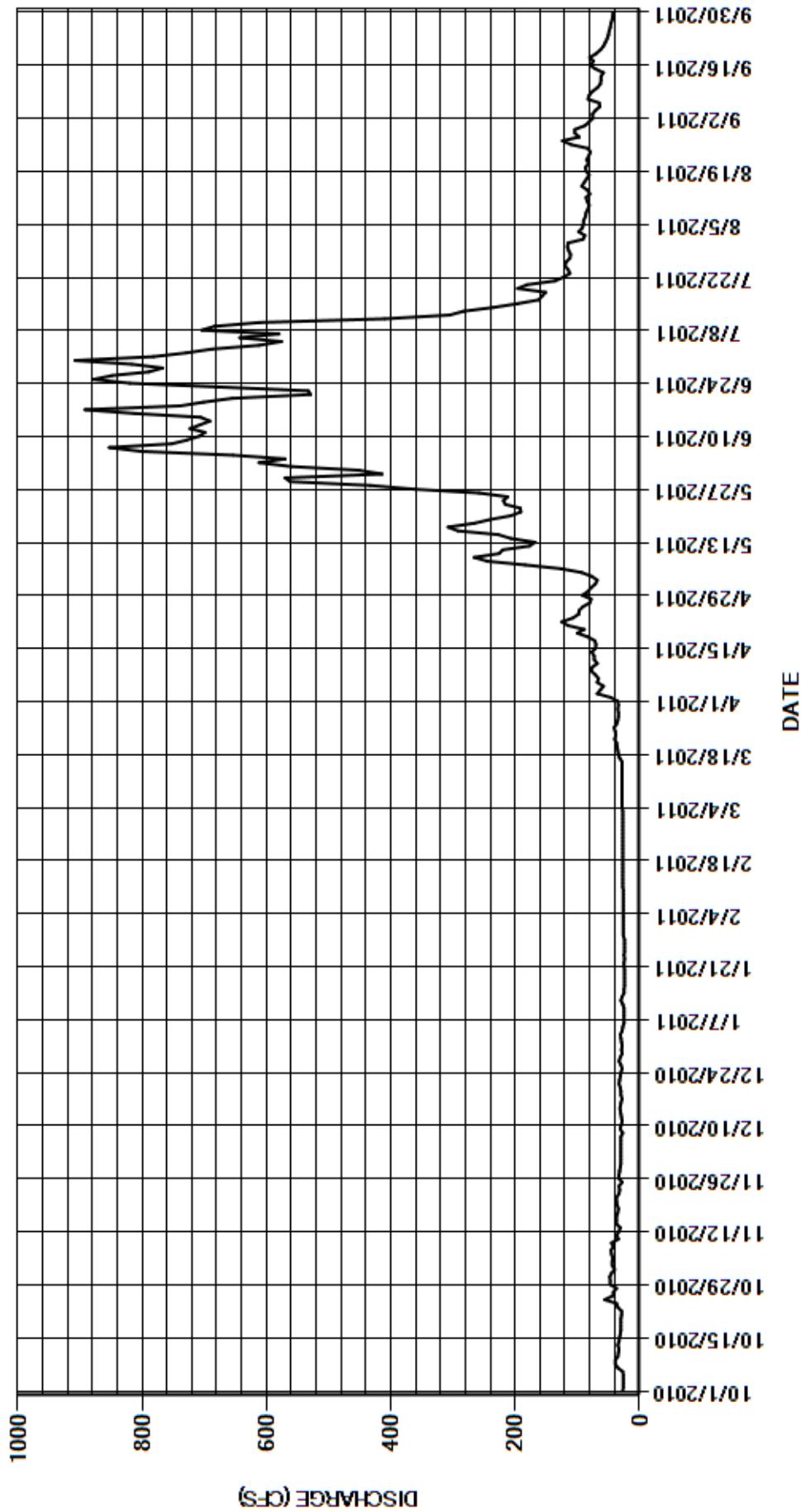
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	27	45	30	29	e26	e27	35	78	451	782	91	81
2	26	40	30	30	e26	e27	46	71	560	729	88	75
3	26	44	30	31	e26	e27	68	68	612	688	98	76
4	26	44	30	28	e26	e28	63	77	570	612	92	71
5	26	43	30	27	e26	e28	58	93	654	576	90	64
6	27	45	30	25	e26	e28	68	126	802	643	90	65
7	35	46	30	25	e26	e28	66	184	853	580	87	83
8	39	42	27	25	e26	e28	71	245	752	704	86	81
9	39	45	31	25	e26	e28	78	266	728	684	83	76
10	35	34	30	25	e26	e28	76	226	708	612	81	68
11	34	37	28	27	e27	e28	68	220	699	410	84	63
12	33	33	29	30	e27	e28	73	177	723	305	86	62
13	35	31	30	28	e27	e28	73	168	707	e283	80	62
14	33	37	31	25	e27	e28	77	207	691	e235	84	58
15	32	37	31	25	e27	e28	71	227	706	e196	93	71
16	31	37	30	24	e27	28	70	292	812	162	89	80
17	30	35	28	24	e27	32	72	308	892	157	85	74
18	30	34	30	24	e27	34	83	266	739	151	81	80
19	30	36	30	24	e27	35	100	240	701	196	86	70
20	30	37	31	24	e27	36	89	207	655	181	87	63
21	29	37	33	25	e27	37	115	191	529	136	82	58
22	29	33	32	25	e27	40	125	192	533	122	85	55
23	35	32	31	24	e27	38	107	216	678	112	82	52
24	37	33	30	25	e27	39	98	219	820	115	79	50
25	56	28	28	24	e27	41	97	212	878	120	83	49
26	43	33	30	24	e27	37	91	258	849	118	110	47
27	42	33	33	24	e27	35	80	362	789	112	124	46
28	37	32	31	24	e27	34	78	433	767	111	97	44
29	47	31	28	26	---	34	92	562	817	114	104	43
30	47	30	29	e26	---	35	83	570	908	116	104	43
31	48	---	28	e26	---	34	---	414	---	115	88	---
TOTAL	1074	1104	929	798	746	986	2371	7375	21583	10177	2779	1910
MEAN	34.6	36.8	30.0	25.7	26.6	31.8	79.0	238	719	328	89.6	63.7
AC-FT	2130	2190	1840	1580	1480	1960	4700	14630	42810	20190	5510	3790
MAX	56	46	33	31	27	41	125	570	908	782	124	83
MIN	26	28	27	24	26	27	35	68	451	111	79	43
CAL YR	2010	TOTAL	33272	MEAN	91.2	MAX	1120	MIN	18	AC-FT	66000	
WTR YR	2011	TOTAL	51832	MEAN	142	MAX	908	MIN	24	AC-FT	102800	

MAX DISCH: 1160 CFS AT 01:00 ON JUN 25,2011 GH 4.12 FT SHIFT 0 FT (Used chart record)

MAX GH: 4.12 FT AT 01:00 ON JUN 25,2011 (Used chart record)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09078600 FRYINGPAN RIVER NEAR THOMASVILLE
WY2011 HYDROGRAPH



ROARING FORK RIVER BASIN
09080100 FRYINGPAN RIVER AT MEREDITH
Water Year 2011

Location.--	Lat. 39°21'45", Long. 106°43'55", in SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 11, T.8 S., R.84 W., Eagle County, Hydrologic Unit 14010004, on left bank at Meredith, CO, 0.1 mi downstream from Waterbury Creek, 0.7 mi downstream from Jakeman Gulch.
Drainage Area and Period of Record.--	Drainage area is 191 mi ² . Established October 1910. Gage at present location from Oct. 1, 1966 through present. Operated by State of Colorado since 1981. Record available from Oct. 1, 1910 – Jan. 31, 1915 & Oct. 1, 1966 – present.
Equipment.--	Graphic water stage recorder, a Sutron SatLink2 data collection platform (DCP), and a Model 56-0540 Sutron shaft encoder in a standard 42-in corrugated metal shelter and well. Recorder and shaft encoder have separate floats and are set to an inside reference point with a drop tape.
Hydrologic Conditions.--	Transmountain diversions above station occur through the Boustead and Busk-Ivanhoe Tunnels.
Gage-Height Record.--	The primary record is 15 minute shaft encoder data downloaded from satellite telemetry with chart data and DCP downloads used for backup purposes. The record is complete and reliable, except for the periods of ice affected gage height on Nov. 22, 23, 2010 and no gage height record from Nov. 24, 2010 through Mar. 23, 2011 when the well was frozen. DCP malfunction resulted in no satellite transmitted data from Nov. 28, 2010 through Apr. 12, 2011. Hourly average gage height data was entered from the chart for the period of Mar. 24 through Mar. 31, 2011, and verified for trend and accuracy by comparison with hourly gage height values of FRYTHOCO gage. Average daily values from the chart record were used for the period Apr. 1 through Apr. 11, 2011. Shaft encoder corrections were applied throughout the period of record.
Datum Corrections.--	Levels were run on August 24, 2011 to the RP index using R.M. 1 as base. The RP index was found to be -0.008 feet low. No corrections were made since the RP was found to be within the allowable error tolerances.
Rating.--	Low water control is a riffle approximately 80 ft. below the gage house. High water control is the bank of the channel. Rating 4, in use since October 1, 1984, was used all water year. It is well defined from 25 to 1,700 cfs. Eight discharge measurements Nos. 435-442 were made during the water year ranging from 40.3 to 1190 cfs. They cover the range in stage except for the higher daily flows of Jun. 6-7, 16-17, 24-26, 30, 2011; and the lower daily flows of Oct. 1-6, Nov 25, Dec. 8, 2010, Jan. 6-10, 14-31, Feb. 1-28, and Mar. 1-3, 14-16, 2011. The peak discharge of 1650 cfs occurred at 0300 on Jun 17, 2011 at a gage height of 4.85 ft with a shift of 0.16 ft. The peak gage height exceeded high Measurement No. 441 by 0.58 ft. in stage.
Discharge.--	Shifting control method was used during the entire water year. Shifts were distributed by time and stage. Shifts were distributed by time from Oct. 1, 2010 until May 25, 2011. Shifts were distributed by stage using a stage-shift relationship (FRYMERCOVS11A) developed from measurements 440-443 and applied from May 25, 2011 through the end of the water year. Measurements made this year indicate shifts ranging from -0.05 to +0.16 ft. All were given full weight and applied directly except for measurement Nos. 439, 440 and 442 which were discounted from -3% to +2% to smooth shift distribution. The shift from measurement Nos. 437 and 438 were not used because they were affected by ice on the control.
Special Computations.--	Discharge for ice affected gage height and the period of frozen well was estimated from winter ice measurements and hydrographic comparison with hourly discharge at the Fryingpan River near Thomasville (FRYTHOCO) gage.
Remarks.--	Record is good except for periods of no gage height which are considered poor, and period developed from chart record only (Mar 24 through Apr 11) which is considered fair. Station maintained and record developed by Craig Bruner
Recommendations.--	Attempt to get more measurements at stages above 3.50 ft. including at least one measurement at a GH above 4.30 to verify stage-discharge relationship.

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09080100 FRYINGPAN RIVER AT MEREDITH

RATING TABLE.-- FRYMERCO04 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

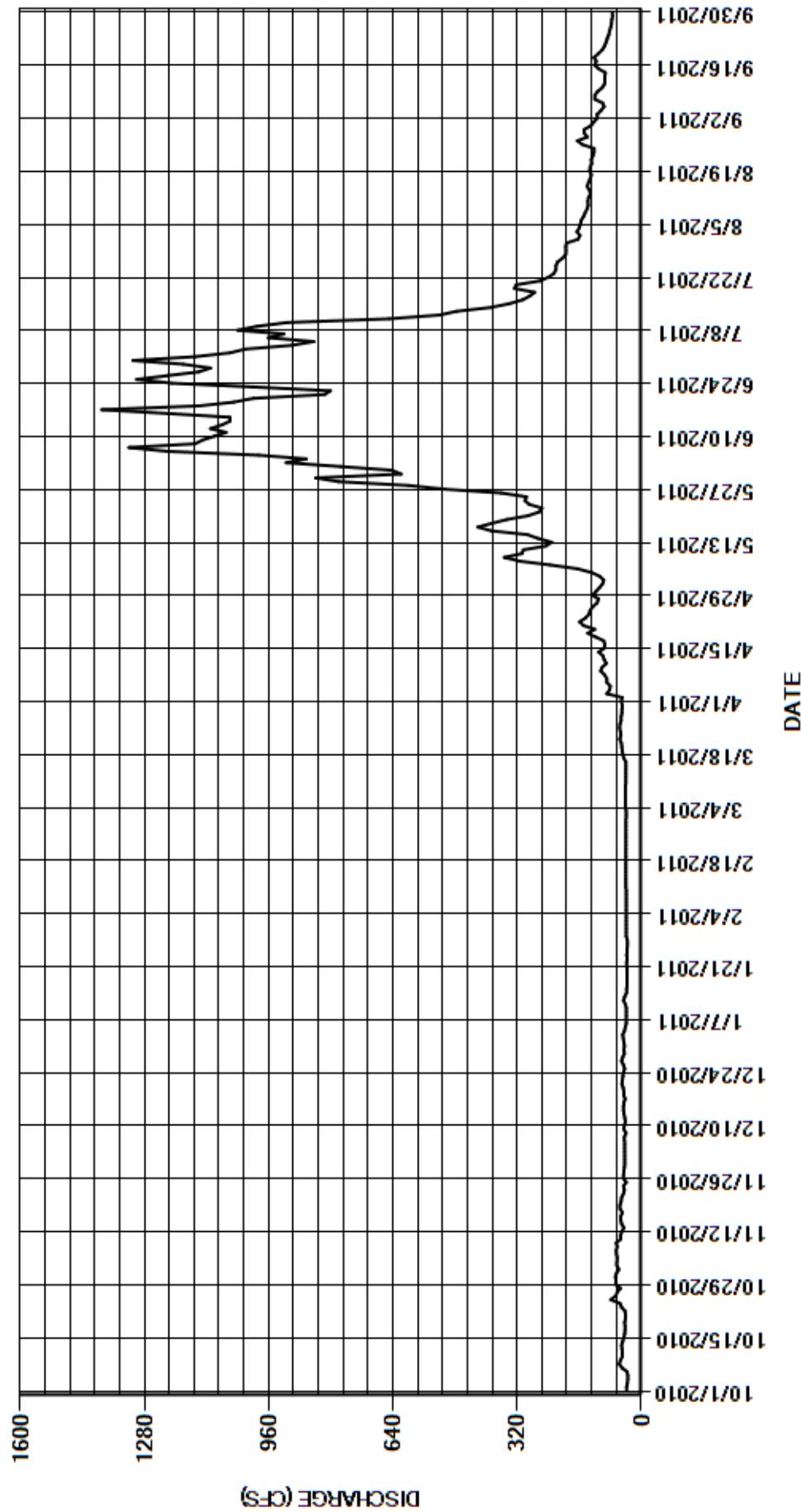
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	38	64	e43	e45	e39	e39	52	108	642	1150	163	122
2	38	58	e43	e46	e39	e39	49	100	775	1060	158	114
3	36	63	e43	e48	e39	e39	89	97	915	1020	166	114
4	35	63	e43	e43	e39	e41	82	107	863	900	160	104
5	35	62	e43	e42	e39	e41	80	128	986	844	157	96
6	37	64	e44	e39	e39	e41	89	165	1220	961	155	100
7	50	65	e44	e39	e39	e40	89	235	1320	921	149	120
8	57	62	e39	e38	e39	e40	95	313	1150	1040	145	120
9	54	65	e45	e38	e39	e40	105	353	1130	991	140	113
10	49	53	e44	e38	e39	e40	101	308	1100	913	137	101
11	49	54	e41	e42	e40	e40	90	304	1070	650	138	95
12	50	50	e43	e46	e40	e40	96	246	1110	520	136	94
13	51	45	e44	e43	e40	e40	99	231	1080	475	131	94
14	48	51	e46	e38	e40	e40	110	266	1060	387	134	93
15	45	53	e46	e38	e40	e40	96	293	1060	340	140	110
16	43	53	e45	e37	e40	e40	94	386	1220	306	136	120
17	42	49	e42	e37	e40	e45	97	421	1390	288	132	116
18	42	55	e45	e37	e40	e48	118	385	1140	275	129	122
19	43	55	e45	e37	e40	e49	138	346	1050	327	133	111
20	41	52	e47	e36	e40	e50	120	292	999	322	132	101
21	41	51	e50	e38	e40	e52	149	263	816	261	128	95
22	42	e46	e49	e38	e40	e56	159	256	801	239	129	91
23	51	e44	e47	e36	e40	e53	144	289	1000	225	125	88
24	55	e46	e46	e38	e40	54	135	300	1210	220	122	84
25	79	e39	e43	e36	e40	56	132	296	1300	220	122	82
26	66	e46	e46	e36	e40	55	125	361	1220	216	152	79
27	62	e46	e51	e36	e39	52	114	506	1140	203	165	77
28	54	e45	e48	e36	e39	52	110	600	1110	195	139	76
29	66	e44	e44	e39	---	50	126	780	1180	194	147	74
30	65	e43	e45	e39	---	50	117	839	1310	195	147	75
31	67	---	e44	e39	---	49	---	619	---	193	130	---
TOTAL	1531	1586	1388	1218	1108	1411	3200	10193	32367	16051	4377	2981
MEAN	49.4	52.9	44.8	39.3	39.6	45.5	107	329	1079	518	141	99.4
AC-FT	3040	3150	2750	2420	2200	2800	6350	20220	64200	31840	8680	5910
MAX	79	65	51	48	40	56	159	839	1390	1150	166	122
MIN	35	39	39	36	39	39	49	97	642	193	122	74
CAL YR	2010	TOTAL	48102	MEAN	132	MAX	1410	MIN	32	AC-FT	95410	
WTR YR	2011	TOTAL	77411	MEAN	212	MAX	1390	MIN	35	AC-FT	153500	

MAX DISCH: 1650 CFS AT 03:00 ON JUN 17,2011 GH 4.85 FT SHIFT 0.16 FT

MAX GH: 4.85 FT AT 03:00 ON JUN 17,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09080100 FRYINGPAN RIVER AT MEREDITH
WY2011 HYDROGRAPH



ROARING FORK RIVER BASIN
09080300 ROCKY FORK CREEK NEAR MEREDITH
Water Year 2011

Location.--	Lat. 39°21'42", Long. 106°49'12", in NW 1/4 NW 1/4 Sec. 18, T.8 S., R.84 W., Pitkin County, Hydrologic Unit 14010004 on right bank at upstream end of flume constructed to carry Rocky Fork Creek across spillway to auxiliary outlet of Ruedi Dam on Fryingpan River and 4.6 mi west of Meredith, CO.
Drainage Area and Period of Record.--	Drainage area is 12.3 mi ² . Station established by USGS Oct. 1, 1968. State of Colorado took over operation of station on Jan. 20, 1977. Published streamflow record Oct. 1, 1968 to present.
Equipment.--	Stevens A-35 graphic water-stage recorder and a shaft encoder (owned by USBR) housed in a 42-in diameter corrugated metal shelter and stilling well in stream on right bank upstream of concrete weir control. Shaft encoder is hard-wired to data collection platform (DCP) located in control house on top of Ruedi Reservoir Dam to facilitate satellite transmission of data. Recorder and shaft encoder are set by drop tape to an adjustable reference point on edge of equipment shelf. Shelter is equipped with an outside staff gage that is used as a secondary reference.
Hydrologic Conditions.--	Basin is entirely USFS land and there is no development or roads except for trailhead parking 1/4 mile above station. There are no diversions above station. Discharge from gage is subtracted from downstream USGS gage FRYRUDCO to calculate Ruedi Reservoir releases.
Gage-Height Record.--	The primary record is 15-minute satellite data with chart record used for backup. The record is complete and reliable, except for Oct 4, 7-13, 30-31; Nov 1-9, 2010; and Aug 29-31; and Sep 1-8, 2011 (backwater from beaver dams); and Nov 22, 2010 to Mar 21, 2011 (frozen well); and Aug 8-24, 2011 (well isolated from stream). Checks between the primary and backup records generally agreed within +/- 0.02 ft.
Datum Corrections.--	Levels were not run during Water Year 2011. Levels were last run Sep. 1, 2009 using BM#1 as the base.
Rating.--	Control is a 38 ft. wide v-notch, sharp crested weir adjacent to gage house. Rating 2 was used for the entire period of record and has been in place since Nov 11, 2004. Seven discharge measurements (95 - 101) made during WY 2011, and measurement 102 made subsequently, were used for analysis. Measurements ranged from 2.06 to 70.2 cfs and covered the entire range of discharge experienced at the gage except for the higher daily flows of Jun 6-30, 2011. The peak discharge of 93.7 cfs occurred at 1830 on Jun 17, 2011 at a gage height of 1.60 ft with a shift of 0.09 ft. The peak exceeded the stage of Measurement No. 99 by 0.19 ft.
Discharge.--	Shifting section control method was used for Water Year. Shifts were applied using variable stage-shift relationship RFCMERC0VS03 for the entire water year. Measurement shifts ranged from -0.03 ft. to +0.09 ft. All measurements were applied directly and given full weight except for measurements 97, 100, and 101 which were discounted -4% to +4% to smooth the shift distribution. Measurement 96 was made during the period of no gage height when the well was frozen.
Special Computations.--	Average daily discharge during periods of backwater from beaver dams, frozen well, and isolated well was estimated by straight-line pro-ration with adjacent good shaft encoder data. Insufficient information was available to perform a hydrographic comparison with downstream gage operated by USGS that factored in variable releases for Ruedi Reservoir.
Remarks.--	Record is rated as good, except for periods of ice effect, beaver dam backwater effect and no gage height record, which are estimated and are poor. Station maintained and record developed by Craig Bruner.
Recommendations.--	Upper end of stage-discharge rating RFCMERC002 should be revised after high flow measurements in WY2012.

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09080300 ROCKY FORK CREEK NEAR MEREDITH

RATING TABLE-- RFCMERCO02 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

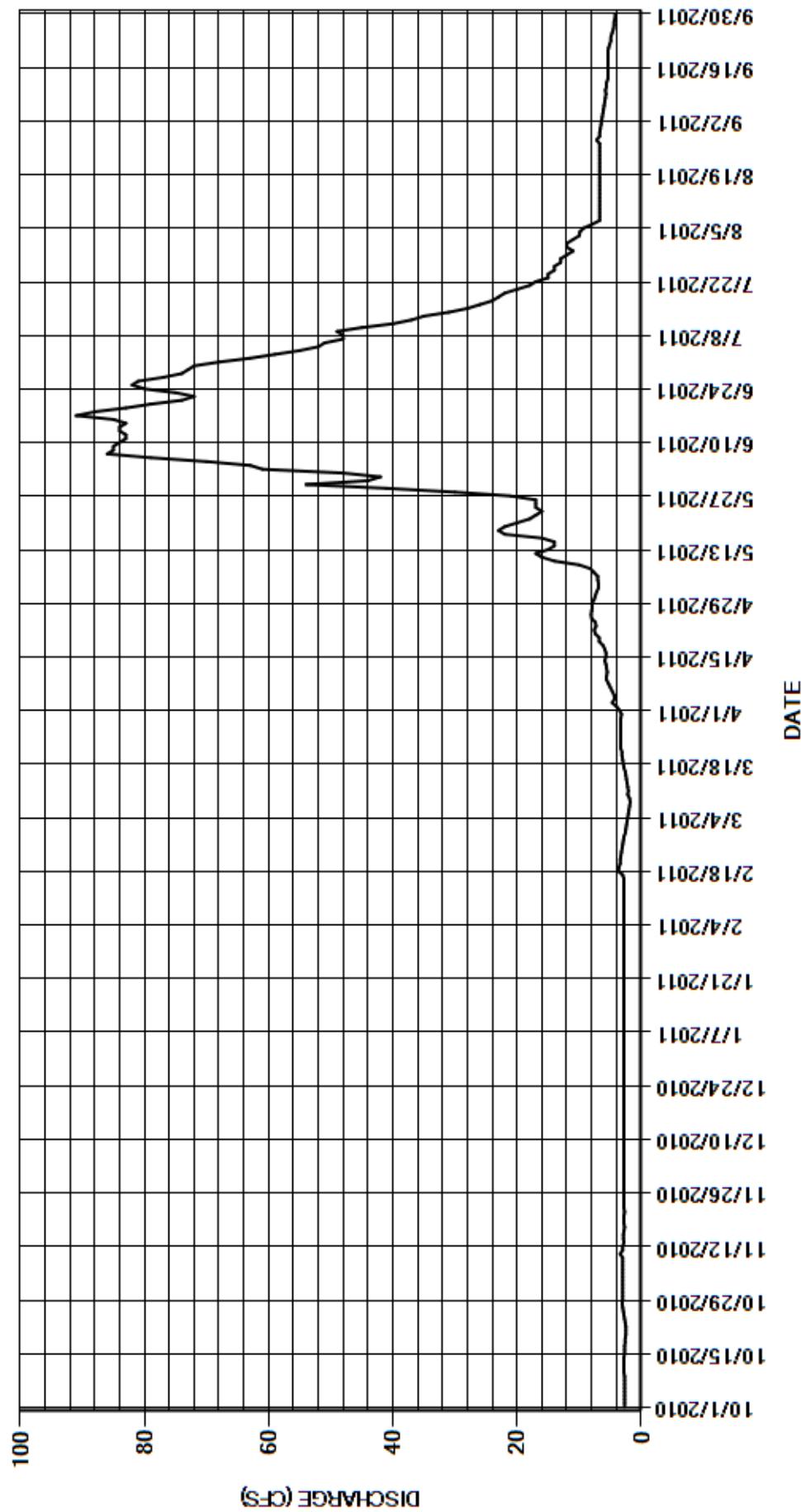
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.7	e3.0	e2.8	e2.8	e2.8	e2.5	3.5	7.4	42	68	12	e6.5
2	2.7	e3.0	e2.8	e2.8	e2.8	e2.4	4.0	7.2	48	63	11	e6.4
3	2.7	e3.0	e2.8	e2.8	e2.8	e2.3	4.7	6.9	61	59	10	e6.3
4	e2.7	e3.0	e2.8	e2.8	e2.8	e2.2	4.3	6.9	63	55	9.9	e6.2
5	2.7	e3.0	e2.8	e2.8	e2.8	e2.1	4.4	7.0	70	52	9.3	e6.1
6	2.7	e3.0	e2.8	e2.8	e2.8	e2.0	4.7	7.0	79	51	7.9	e6.0
7	e2.7	e3.0	e2.8	e2.8	e2.8	e1.9	5.0	7.6	86	48	6.7	e5.9
8	e2.7	e3.0	e2.8	e2.8	e2.8	e1.8	5.3	8.2	85	48	e6.7	e5.8
9	e2.7	e3.0	e2.8	e2.8	e2.8	e1.9	5.6	10	85	49	e6.7	5.7
10	e2.8	3.4	e2.8	e2.8	e2.8	e2.2	5.6	14	84	45	e6.7	5.8
11	e2.8	3.0	e2.8	e2.8	e2.8	e2.1	5.5	16	83	40	e6.7	5.6
12	e2.8	3.0	e2.8	e2.8	e2.8	e2.2	5.6	17	83	37	e6.7	5.6
13	e2.8	2.8	e2.8	e2.8	e2.8	e2.3	5.7	15	84	35	e6.7	5.4
14	2.8	2.9	e2.8	e2.8	e2.8	e2.4	5.9	14	84	31	e6.7	5.4
15	2.7	2.9	e2.8	e2.8	e2.8	e2.5	5.7	14	83	28	e6.7	5.4
16	2.7	2.8	e2.8	e2.8	e2.8	e2.6	5.7	16	85	26	e6.7	5.4
17	2.7	2.7	e2.8	e2.8	e3.0	e2.8	5.9	22	91	24	e6.7	5.4
18	2.6	2.8	e2.8	e2.8	e3.7	e2.9	6.2	23	88	23	e6.7	5.4
19	2.6	2.8	e2.8	e2.8	e3.6	e3.0	6.8	22	83	22	e6.7	5.4
20	2.5	2.8	e2.8	e2.8	e3.4	e3.1	6.8	20	79	20	e6.7	5.4
21	2.5	2.7	e2.8	e2.8	e3.4	3.1	7.4	18	74	18	e6.7	5.3
22	2.5	e2.8	e2.8	e2.8	e3.3	3.3	7.6	17	72	17	e6.7	5.1
23	2.6	e2.8	e2.8	e2.8	e3.2	3.3	7.3	16	75	15	e6.7	4.9
24	2.7	e2.8	e2.8	e2.8	e3.1	3.3	7.4	17	80	15	e6.7	4.9
25	2.8	e2.8	e2.8	e2.8	e3.0	3.3	8.0	17	82	14	6.7	4.7
26	2.9	e2.8	e2.8	e2.8	e2.9	3.3	8.1	17	81	14	6.7	4.5
27	3.0	e2.8	e2.8	e2.8	e2.8	3.3	8.0	21	77	13	6.7	4.4
28	3.1	e2.8	e2.8	e2.8	e2.6	3.3	7.9	30	74	13	7.2	4.4
29	3.0	e2.8	e2.8	e2.8	---	3.3	7.9	41	73	12	e6.7	4.2
30	e3.0	e2.8	e2.8	e2.8	---	3.3	7.6	54	72	11	e6.7	4.2
31	e3.0	---	e2.8	e2.8	---	3.2	---	44	---	12	e6.6	---
TOTAL	85.2	86.8	86.8	86.8	82.8	83.2	184.1	553.2	2306	978	228.0	161.7
MEAN	2.75	2.89	2.80	2.80	2.96	2.68	6.14	17.8	76.9	31.5	7.35	5.39
AC-FT	169	172	172	172	164	165	365	1100	4570	1940	452	321
MAX	3.1	3.4	2.8	2.8	3.7	3.3	8.1	54	91	68	12	6.5
MIN	2.5	2.7	2.8	2.8	2.6	1.8	3.5	6.9	42	11	6.6	4.2
CAL YR	2010	TOTAL	2719.3	MEAN	7.45	MAX	57	MIN	1.9	AC-FT	5390	
WTR YR	2011	TOTAL	4922.6	MEAN	13.5	MAX	91	MIN	1.8	AC-FT	9760	

MAX DISCH: 93.7 CFS AT 18:30 ON JUN 17,2011 GH 1.60 FT SHIFT 0.09 FT

MAX GH: 1.60 FT AT 18:30 ON JUN 17,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09080300 ROCKY FORK CREEK NEAR MEREDITH
WY2011 HYDROGRAPH



ROARING FORK RIVER BASIN
CRYSTAL RIVER AT DOW FISH HATCHERY AB CARBONDALE
Water Year 2011

Location.--	Lat 39°22'38", Long 107°12'17" in SW 1/4 of NE 1/4 of Sec. 10, T8S, R88W in Garfield County. Located on right bank of Crystal River, at upstream side of County Road 118 Bridge, and 0.75 mi. below confluence with Prince Creek.
Drainage Area and Period of Record.--	The drainage area above the gage is 340 sq. mi. Station constructed October 2006 with satellite telemetry equipment. Gage operated by State of Colorado Division of Water Resources at same location and datum since establishment.
Equipment.--	Sutron Constant Flow Bubbler (CFB) sensor and Sutron SatLink 2 data collection platform (DCP) housed in 2 ft rectangular steel shelter. The CFB orifice pipe is below the upstream side of County Road 118 bridge. The CFB is set to a wire weight gage on the upstream side of the bridge.
Hydrologic Conditions.--	Drainage basin is the Crystal River basin. The stream banks are moderate to steep sloping with exposed boulders along the lower portions. Control is rock and cobble channel at all stages, with bridge abutment walls becoming part of the control at higher stages. Seasonal diversions occur upstream and downstream of station.
Gage-Height Record.--	The primary record is 15-minute DCP data with the satellite-transmitted data used as backup. The partial year record is complete and reliable for the 6-month period of operation from April 1, 2011 to September 30, 2011, except for the high flow period from May 26, 2011 to July 21, 2011 when the constant flow bubbler did not track gage height very well. The gage was visited on 8 separate occasions this water year to verify the instrument remained calibrated to the primary reference gage. The constant flow bubbler was adjusted 9 times during the period of record. They were made on April 4, 2011 (-0.03 ft.), May 26, 2011 (+0.10 ft. & -0.03 ft.), June 29, 2011 (+0.78 ft. & -0.09 ft.), July 21, 2011 (-0.78 ft.), August 18, 2011 (-0.06 ft.), August 31, 2011 (-0.02 ft.) and September 27, 2011 (-0.03 ft.).
Datum Corrections.--	Levels were last run on Mar 25, 2010. Using RM 1 as a base, the wire weight gage was found to read correct and no adjustment to the RP was made.
Rating.--	Rating No. 6, in use since Oct. 1, 2008, was used for the entire period of record (Apr 1 – Sep 30). Seven discharge measurements (Nos. 29-35) made during WY 2011, and No. 36 made after the period of record, were used for analysis. The measurements ranged in discharge from 84.2 cfs to 3310 cfs and cover the range of discharge experienced during the period of record, except for the lower daily flows on September 3-6; 12-14, 27-30, 2011 and the higher daily flows on Jun 6-7, 16-17, 24-30; July 1, 2011. The peak instantaneous flow of 5,560 cfs occurred at 0245 Jun. 7, 2011 at a gage height of 9.00 ft with a shift of -0.06 ft. It exceeded the stage of measurement No. 31 made Jun. 29, 2011 by 1.04 feet in stage.
Discharge.--	Shifting control method was used for WY 2011. The shifts were distributed by time and stage throughout the entire period of record. Shifts were distributed by time from 0000 on Apr. 1, 2011 to 1445 on April 18, 2011. Shifts were distributed by stage utilizing shift curve CRYDOWCOVS11_1a as defined by measurement nos. 29-31, from 1500 on April 18, 2011 to 0300 on July 1, 2011. Shifts were distributed by stage utilizing shift curve CRYDOWCOVS11_2 as defined by measurements no. 31-33, from 0315 on July 1, 2011 to 1030 on August 18, 2011. Shifts were distributed by time from 1045 on August 18, 2011 to the end of the water year. Open water measurements show shifts varying from -0.06 to +0.15 ft. Shifts were applied directly and given full weight except for measurement Nos. 30 and 35 which were discounted from +1% to +5% to smooth shift distribution.
Special Computations.--	No special computations were done this water year.
Remarks.--	Record is rated good for the period of record, except for the period from May 26, 2011 to July 21, 2011, which is rated fair due to the inability to get a stable gage height on the bubbler. The instantaneous peak flow should be rated as fair for the same reason. Gaging station operated and maintained by James Kellogg and Jana Miller and record developed by Jana Miller.
Recommendations.--	Use Total Station to survey cross-section of channel at gage and better define potential break-points in stage-discharge rating. Also, more measurements during the spring runoff to capture a larger range of flows would help define the rating and determine the channel characteristics during high flows.

STATE OF COLORADO
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CRYSTAL RIVER AT DOW FISH HATCHERY AB CARBONDALE

RATING TABLE-- CRYDOWCO06 USED FROM 01-APR-2011 TO 30-SEP-2011

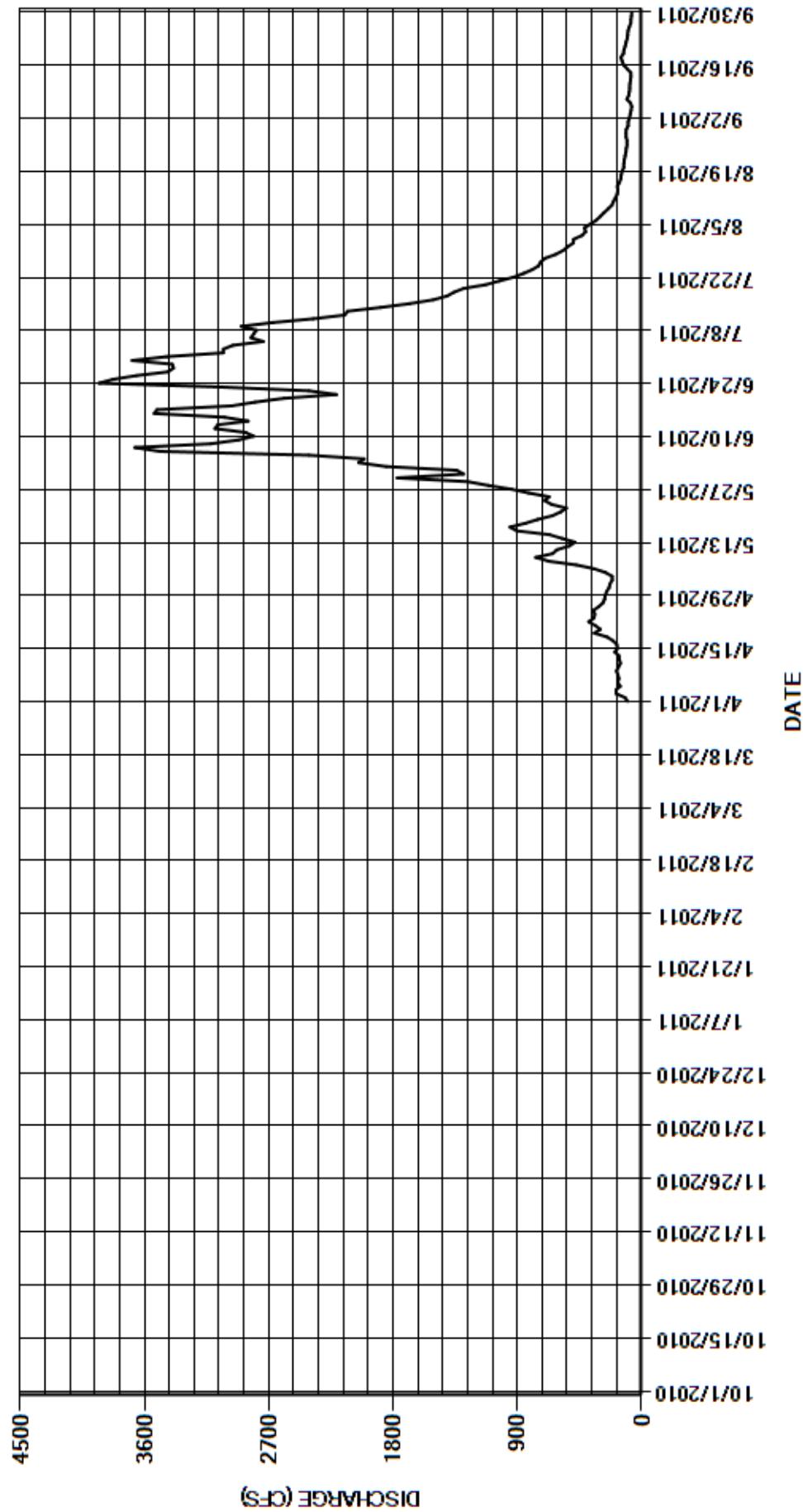
DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011												
DAY	MEAN VALUES											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	102	236	1340	3440	493	98
2	---	---	---	---	---	---	121	229	1850	3030	432	88
3	---	---	---	---	---	---	185	213	2050	3030	406	83
4	---	---	---	---	---	---	186	214	2010	2960	414	77
5	---	---	---	---	---	---	155	261	2410	2740	372	72
6	---	---	---	---	---	---	174	344	3490	2830	330	81
7	---	---	---	---	---	---	165	472	3670	2810	300	107
8	---	---	---	---	---	---	172	674	3120	2790	273	94
9	---	---	---	---	---	---	182	767	2920	2900	244	89
10	---	---	---	---	---	---	169	644	2810	2670	215	86
11	---	---	---	---	---	---	154	614	2870	2380	204	85
12	---	---	---	---	---	---	161	526	3090	2150	189	81
13	---	---	---	---	---	---	164	482	3070	2130	176	78
14	---	---	---	---	---	---	194	576	2850	1890	173	79
15	---	---	---	---	---	---	175	668	3020	1680	176	105
16	---	---	---	---	---	---	180	903	3530	1510	161	130
17	---	---	---	---	---	---	207	953	3510	1410	151	141
18	---	---	---	---	---	---	251	843	2970	1360	148	150
19	---	---	---	---	---	---	342	753	2800	1290	141	132
20	---	---	---	---	---	---	299	646	2590	1130	129	129
21	---	---	---	---	---	---	336	587	2210	1030	129	119
22	---	---	---	---	---	---	383	545	2410	926	125	113
23	---	---	---	---	---	---	346	653	3060	854	120	105
24	---	---	---	---	---	---	340	703	3930	791	114	101
25	---	---	---	---	---	---	349	670	3830	746	111	99
26	---	---	---	---	---	---	310	818	3660	731	105	90
27	---	---	---	---	---	---	280	942	3430	698	105	79
28	---	---	---	---	---	---	268	1110	3390	623	113	78
29	---	---	---	---	---	---	264	1260	3400	570	114	74
30	---	---	---	---	---	---	253	1770	3690	537	111	72
31	---	---	---	---	---	---	---	1290	---	495	98	---
TOTAL	---	---	---	---	---	---	6867	21366	88980	54131	6372	2915
MEAN	---	---	---	---	---	---	229	689	2966	1746	206	97.2
AC-FT	---	---	---	---	---	---	13620	42380	176500	107400	12640	5780
MAX	---	---	---	---	---	---	383	1770	3930	3440	493	150
MIN	---	---	---	---	---	---	102	213	1340	495	98	72
CAL YR	2010	TOTAL	111288	MEAN	608	MAX	4010	MIN	41	AC-FT	220700	(PARTIAL YEAR RECORD)
WTR YR	2011	TOTAL	180631	MEAN	987	MAX	3930	MIN	72	AC-FT	358300	(PARTIAL YEAR RECORD)

MAX DISCH: 5560 CFS AT 02:45 ON JUN 07,2011 GH 9.00 FT SHIFT -0.06 FT

MAX GH: 9.00 FT AT 02:45 ON JUN 07,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CRYSTAL RIVER AT DOW FISH HATCHERY AB CARBONDALE
WY2011 HYDROGRAPH



09089500 WEST DIVIDE CREEK NEAR RAVEN

Water Year 2011

Location.--	Lat 39°19'52", Long 107°34'46" in NE1/4 SW1/4 Sec. 29, T8S, R9W, Hydrologic Unit 14010004 in Mesa County. Station is on left bank about 5 ft downstream of private road bridge, 0.8 mi upstream of Brook Creek, 8 mi south of Raven, and 16 mi south of Silt.
Drainage Area and Period of Record.--	Drainage area is about 64.6 sq mi. Gage established October 1955. Published by the USGS Oct. 1, 1954 to Oct. 1999. Beginning October 1999, station operated seasonally by USGS. Partial year (Apr to Oct) record published by the USGS Apr. 2000 to Oct. 2005. The Colorado Division of Water Resources began operation of gage for six month period beginning Apr. 2006. Partial year (Apr to Sep) record published by Colorado Division of Water Resources Apr. 1, 2006 to present. Gage at same site and datum since establishment.
Equipment.--	Sutron constant flow bubbler (CFB) sensor in corrugated metal shelter on 42-in diameter stilling well. Data collection platform (DCP) is a Sutron SatLink 2 in external box. The CFB is referenced to an outside cantilever chain gage. A Sutron Model 0001-1 stage discharge recorder (SDR) provides backup data when the well intake pipes are not isolated from the stream during low stages. The SDR is set by drop tape from an inside reference point on the equipment shelf.
Hydrologic Conditions.--	Streambed is composed of boulders, cobble, and gravel. Banks are moderately steep and not usually subject to overflow. The left abutment of bridge adjacent to gage constricts flow into the right side of the channel immediately above gage. Record includes water imported from Thompson Creek (Roaring Fork Basin), Clear Fork (Muddy Creek Basin), and Owens Creek (Plateau Creek Basin).
Gage-Height Record.--	The primary record is 15-minute satellite telemetry data from the CFB with DCP log of CFB and SDR data used as backup. Data from the constant flow bubbler was used from 0000 Apr 1, 2011 to 1215 May 13, 2011 and 1545 July 8, 2011 to end of water year. Data from the SDR was used from 1230 May 13, 2011 to 1530 July 8, 2011. The gage was visited on 6 separate occasions to verify the instruments remained calibrated to the primary reference gage. Several instrument calibration corrections were made to the sensors during the period of record and are documented in the station visit log. The record is complete and reliable for the six month period of operation (Apr 1 – Sep 30).
Datum Corrections.--	Levels were run to the inside and outside reference points (RPs) on Apr 21, 2010 using RM 4 as a base. The inside RP was found to read correct and no adjustments were made. The outside RP was found to read 0.02 ft. high and was corrected.
Rating.--	The control for low and medium stages is a boulder and cobble riffle 15 ft downstream. Control for higher stages is the channel with boulders having some effect. Rating No. 16 was used for the entire period of record (Apr 1-Sep 30). Six discharge measurements (31 –36) were made during WY 2011. Measurements ranged in discharge from 1.41 to 408 cfs and cover the range of discharge experienced except for the higher average daily flows of May 28-31; and Jun 1-3, 5–8, 2011. The peak discharge of 804 cfs occurred at 1815 on May 29, 2011 at a gage height of 4.76 ft. with a shift of +0.10 ft. It exceeded Measurement No. 33, made on June 7, 2011 by 0.75 feet in stage.
Discharge.--	Shifting control method was used during WY2011. The shifts were applied by stage using variable stage-shift relationships WSDRAVC0VS1A and WSDRAVC0VS2B for the entire six month period. The peak gage height for WY2011 was the transition point between the two stage-shift relationships. Shifts for measurements 31-36 ranged from -0.13 ft to +0.10 ft. Measurements 32, 35, and 36 were discounted from -9 to +3 percent to smooth shift distribution.
Special Computations.--	None.
Remarks.--	Record is rated as good. Station was maintained by Craig Bruner and record was developed by Craig Bruner.
Recommendations.--	Run levels in late March, prior to period of station operation, and attempt to determine gage heights where breakpoints in stage-discharge rating may occur.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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09089500 WEST DIVIDE CREEK NEAR RAVEN

RATING TABLE-- WSDRAVCO16 USED FROM 01-APR-2011 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

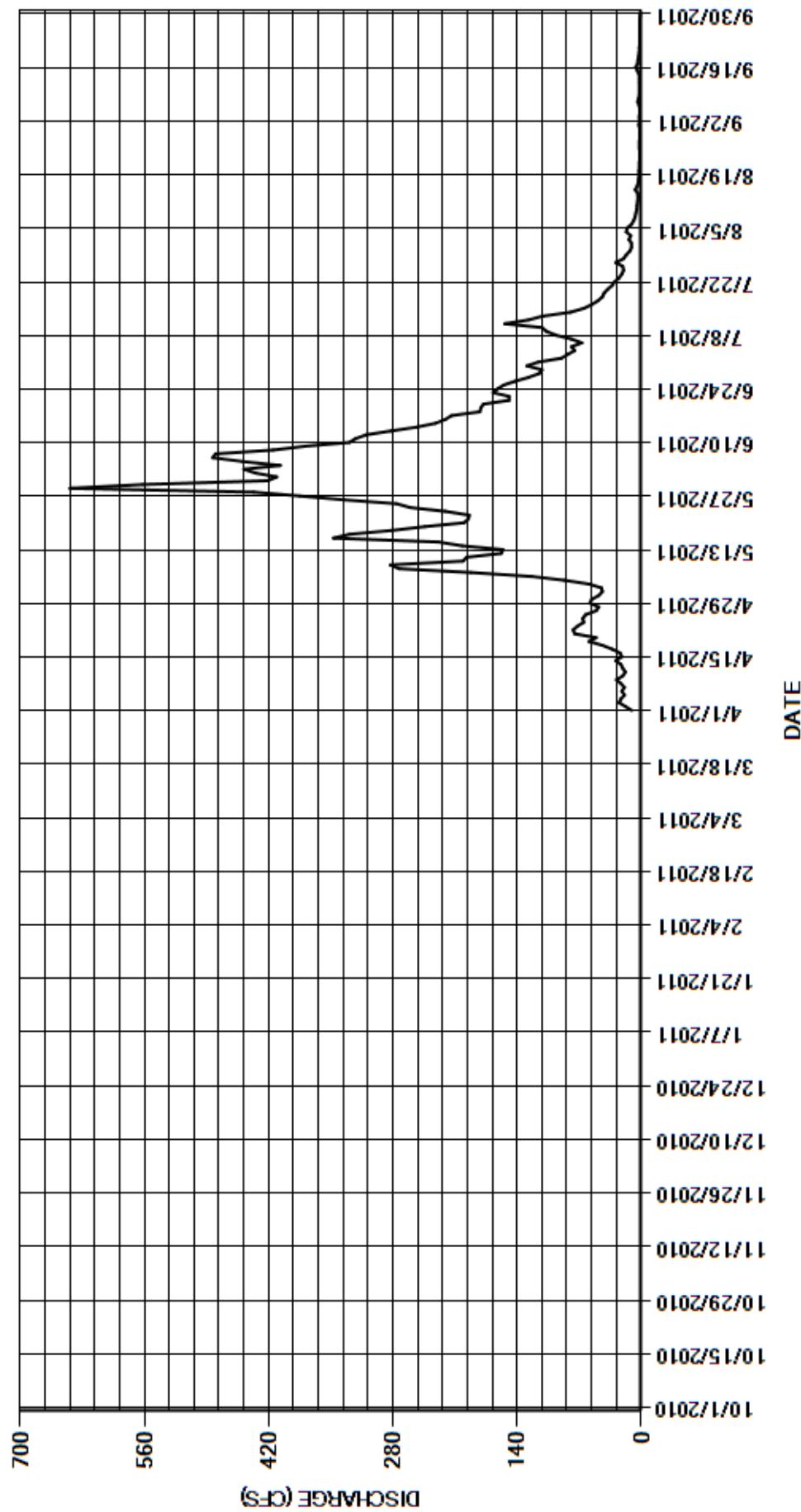
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	11	48	411	116	11	2.8
2	---	---	---	---	---	---	18	44	435	90	14	2.1
3	---	---	---	---	---	---	25	45	448	83	12	2.4
4	---	---	---	---	---	---	23	59	407	75	17	1.8
5	---	---	---	---	---	---	19	87	449	79	16	1.6
6	---	---	---	---	---	---	22	124	483	67	11	2.4
7	---	---	---	---	---	---	19	192	480	79	8.6	4.2
8	---	---	---	---	---	---	23	273	415	96	6.9	2.8
9	---	---	---	---	---	---	28	283	379	107	6.0	2.2
10	---	---	---	---	---	---	21	201	329	112	5.1	2.1
11	---	---	---	---	---	---	18	197	322	154	4.7	2.1
12	---	---	---	---	---	---	21	158	310	127	4.2	2.3
13	---	---	---	---	---	---	23	156	282	111	3.8	2.3
14	---	---	---	---	---	---	29	202	253	80	4.0	2.4
15	---	---	---	---	---	---	22	229	232	65	6.8	4.3
16	---	---	---	---	---	---	24	347	221	56	4.5	6.3
17	---	---	---	---	---	---	33	329	214	49	3.6	4.1
18	---	---	---	---	---	---	44	281	182	44	3.0	3.8
19	---	---	---	---	---	---	59	244	181	42	2.6	3.0
20	---	---	---	---	---	---	51	200	178	38	2.6	2.4
21	---	---	---	---	---	---	75	195	149	33	2.3	2.2
22	---	---	---	---	---	---	77	194	149	30	2.2	2.0
23	---	---	---	---	---	---	72	221	167	25	2.0	1.9
24	---	---	---	---	---	---	65	261	162	22	1.9	1.9
25	---	---	---	---	---	---	66	276	155	20	1.9	1.7
26	---	---	---	---	---	---	63	335	142	21	2.2	1.6
27	---	---	---	---	---	---	51	385	127	29	2.1	1.6
28	---	---	---	---	---	---	48	437	115	20	2.1	1.6
29	---	---	---	---	---	---	58	644	112	17	2.0	1.6
30	---	---	---	---	---	---	56	562	129	13	1.8	1.5
31	---	---	---	---	---	---	---	421	---	11	2.0	---
TOTAL	---	---	---	---	---	---	1164	7630	8018	1911	169.9	75.0
MEAN	---	---	---	---	---	---	38.8	246	267	61.6	5.48	2.50
AC-FT	---	---	---	---	---	---	2310	15130	15900	3790	337	149
MAX	---	---	---	---	---	---	77	644	483	154	17	6.3
MIN	---	---	---	---	---	---	11	44	112	11	1.8	1.5
CAL YR	2010	TOTAL	10643.3	MEAN	58.2	MAX	298	MIN	0.42	AC-FT	21110	(PARTIAL YEAR RECORD)
WTR YR	2011	TOTAL	18967.9	MEAN	104	MAX	644	MIN	1.5	AC-FT	37620	(PARTIAL YEAR RECORD)

MAX DISCH: 804 CFS AT 18:15 ON MAY 29,2011 GH 4.76 FT SHIFT 0.1 FT

MAX GH: 4.76 FT AT 18:15 ON MAY 29,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09089500 WEST DIVIDE CREEK NEAR RAVEN
WY2011 HYDROGRAPH



NORTH PLATTE RIVER BASIN
MICHIGAN RIVER NEAR MEADOW CREEK RESERVOIR
Water Year 2011

Location.--	Lat. 40°36'48", Long. 106°05'05", (Gould, Colorado Quadrangle, 1955), SE1/4 of the SE1/4 in Section 36 T8N, R78W in Jackson County. Under bridge on County Road 30 about 700 feet upstream of its confluence with Peterson Creek.
Drainage Area and Period of Record.--	Approximately 99 sq. mi. Formerly known as the Michigan River near Gould station and was relocated due to removal of bridge. Station has been in operation at present location since 1997.
Equipment.--	Sutron shaft encoder (SDI12) housed in 18-inch diameter corrugated metal pipe stilling well with two 2-inch intakes. The shaft encoder is connected via cable to a Sutron high data rate (HDR) data collection platform (DCP) with satellite telemetry. The DCP is located in a gray NEMA box on the same side of the river but on the upstream side of the bridge. The outside staff, with a range of 0.00 to 6.66 feet, is the primary reference gage. It is located on the right bridge abutment just to the left of the stilling well.
Hydrologic Conditions.--	The basin consists of moderate terrain near the gage station, but originates in steep mountainous terrain on the Continental Divide near Thunder Mountain. In the vicinity of the gage station, the channel slope is moderate and has moderate sinuosity. The bed material ranges from silt up to small rock approximately 6-inches in diameter. Meadow Creek Reservoir and several major diversions, located upstream of the gage, can impact flow at the gage.
Gage-Height Record.--	Primary record is 15-minute shaft encoder data from satellite telemetry with the DCP log as backup. Continuous gage height records were kept from October 1 to November 7, 2010 and April 11 to September 30, 2011. Record was not kept during the winter period. The record is complete and reliable except for the following dates: November 7, 2010 (shut-down), April 11, 2011 (start-up), October 27-29, 2010 (ice affected) and September 26-30, 2011 (backwater from beaver dam). Gage height datum corrections (ranging from -0.07 feet to +0.02 feet) were made at the time of site visits.
Datum Corrections.--	Levels were not run this water year. Levels were last run on August 25, 2010 using RM1 as base.
Rating.--	There is no man-made control at this site. The control is a rocky channel. Rating No. 6 in use since Oct. 1, 2005, was used until October 13, 2010. A new rating, Rating No. 07A, was developed and applied from October 13, 2010 to the end of the water year. It is well defined to 1,060 cfs, 142% of the historical highest measurement made in water year 2011. Ten measurements (numbers 89 through 98), ranging in discharge from 10.6 cfs to 746 cfs, were made this water year. Measurements covered the range in stage, except for the lower mean daily flows on October 1-10, 15-22, 27-30; November 5-6, 2010; and higher daily flows on June 7-9, 18, 2011. The instantaneous peak flow of 777 cfs occurred at 0715 on June 7, 2011 at a gage height of 4.17 feet and a shift of 0.00 feet. It exceeded the stage of measurement No. 94, made on June 10, 2011 by 0.09 ft. in stage. The minimum daily flow of 4.0 cfs occurred on October 5, 2011.
Discharge.--	Shifting control method was applied throughout water year 2011. Shifts were distributed by time from 0000 October 1, 2010 to the peak gage height at 0715 on June 7, 2011 and from 1315 on September 15, 2011 to 1100 on October 31, 2011. Shifts were distributed by stage from the peak gage height at 0715 on June 7, 2011 to 1300 on September 15, 2011 using variable stage-shift relationship MICMERCOSC01, which is based on measurements 94 – 98. Open-water measurements showed shifts varying between -0.30 and 0.00 feet. Shifts were applied directly and given full weight, except for measurements 89, 91, 95 and 98 which were discounted from-5% to 3% to smooth shift distribution.
Special Computations.--	Discharge was estimated for shut-down and start-up days based on actual partial day record, discharge measurements, and record from adjacent days. Discharge values were estimated on ice affected days by use of previous and subsequent periods of good record and calculated values of discharge. Discharge for the period when a beaver dam caused backwater at the gage was estimated from adjacent good record and the trend of the hydrograph at the gage downstream (Michigan River at Walden, Co.).
Remarks.--	The record is good, except for the following dates: November 7, 2010 (shut-down), April 11, 2011 (start-up), which is considered fair to poor; October 27-29, 2011 (ice affected), which is considered fair and September 26-30, 2011 (beaver activity), which is considered poor. Station maintained and record developed by Dan Meyer.
Recommendations.--	The effects of WY 2011 and WY 2012 runoff on the control should be evaluated to determine potential revisions to Rating No. 07A. Levels should be completed in WY2012 to continue evaluation of RM movement.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

MICHIGAN RIVER NEAR MEADOW CREEK RESERVOIR

RATING TABLE-- MICMERCO06 USED FROM 01-OCT-2010 TO 13-OCT-2010
MICMERCO07A USED FROM 13-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.6	11	--	--	--	--	--	63	589	742	235	40
2	4.7	11	--	--	--	--	--	59	633	676	220	37
3	4.5	12	--	--	--	--	--	56	716	685	181	36
4	4.1	11	--	--	--	--	--	58	707	644	164	34
5	4.0	9.7	--	--	--	--	--	58	724	643	147	34
6	4.8	10	--	--	--	--	--	78	746	628	135	37
7	6.1	e11	--	--	--	--	--	123	761	608	127	52
8	7.3	--	--	--	--	--	--	216	755	680	115	63
9	8.2	--	--	--	--	--	--	344	755	736	107	46
10	10	--	--	--	--	--	--	382	736	703	98	39
11	11	--	--	--	--	--	e43	393	720	687	91	37
12	13	--	--	--	--	--	42	297	710	624	85	35
13	14	--	--	--	--	--	46	268	707	635	79	35
14	14	--	--	--	--	--	49	315	673	568	72	34
15	8.4	--	--	--	--	--	44	391	673	533	80	45
16	5.7	--	--	--	--	--	43	470	682	498	75	63
17	4.2	--	--	--	--	--	45	457	737	476	68	48
18	5.8	--	--	--	--	--	59	430	758	473	57	49
19	7.2	--	--	--	--	--	65	368	701	596	54	41
20	7.5	--	--	--	--	--	58	287	715	504	54	35
21	5.4	--	--	--	--	--	71	246	730	409	52	34
22	4.3	--	--	--	--	--	73	262	653	359	54	32
23	14	--	--	--	--	--	65	362	651	320	50	30
24	12	--	--	--	--	--	65	401	648	283	47	29
25	17	--	--	--	--	--	69	351	680	265	46	28
26	13	--	--	--	--	--	69	351	690	264	45	e26
27	e8.0	--	--	--	--	--	62	446	688	291	48	e24
28	e7.0	--	--	--	--	--	63	377	665	254	44	e22
29	e9.0	--	--	--	--	--	73	446	673	229	67	e20
30	9.1	--	--	--	--	--	66	610	724	204	52	e18
31	11	--	--	--	--	--	--	532	--	187	44	--
TOTAL	258.9	75.7	--	--	--	--	1170	9497	21000	15404	2793	1103
MEAN	8.35	10.8	--	--	--	--	58.5	306	700	497	90.1	36.8
AC-FT	514	150	--	--	--	--	2320	18840	41650	30550	5540	2190
MAX	17	12	--	--	--	--	73	610	761	742	235	63
MIN	4.0	9.7	--	--	--	--	42	56	589	187	44	18

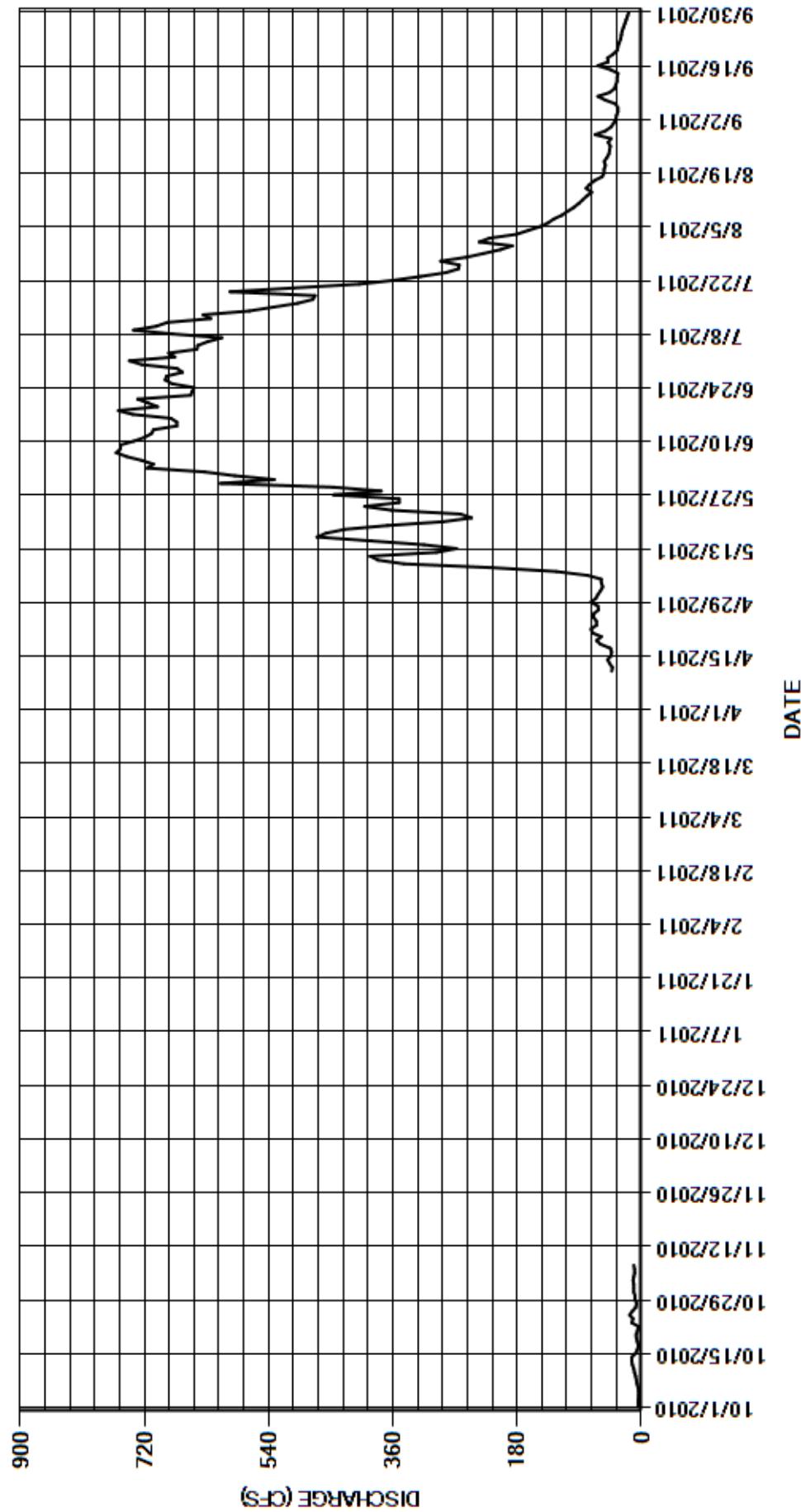
CAL YR	2010	TOTAL	20653.8	MEAN	103	MAX	655	MIN	3.0	AC-FT	40970 (PARTIAL YEAR RECORD)
WTR YR	2011	TOTAL	51301.6	MEAN	243	MAX	761	MIN	4.0	AC-FT	101800 (PARTIAL YEAR RECORD)

MAX DISCH: 777 CFS AT 07:15 ON JUN 07,2011 GH 4.17 FT SHIFT 0 FT

MAX GH: 4.17 FT AT 07:15 ON JUN 07,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

MICHIGAN RIVER NEAR MEADOW CREEK RESERVOIR
WY2011 HYDROGRAPH



NORTH PLATTE RIVER BASIN

06617100 MICHIGAN RIVER AT WALDEN, CO.

Water Year 2011

Location.--	Lat. 40°44'27", Long. 106°16'54", (Walden, Colorado Quadrangle, 1955), NE1/4 of the NE1/4 in Section 21 T9N, R79W in Jackson County, Hydrologic Unit 10180001, on the left bank just upstream of the Highway 125 Bridge on Jackson County property at Town of Walden Water Facility and 2.1 miles upstream of the confluence of Illinois River.
Drainage Area and Period of Record.--	Approximately 182 sq. mi. Originally established by the USGS at a location believed to be just upstream of the present location in May 1904. Records kept by the USGS from May 1904 to October 1905 and May 1923 to October 1947. Re-established by the State Engineer's Office in May 2002. Station was moved downstream approximately one-quarter mile to present location on Oct. 2004 at a different datum. Records kept by the Town of Walden from 1916 to 2002.
Equipment.--	The equipment at this site consists of a Sutron shaft encoder Model SE5600-0531 and high data rate Satlink 2 Data Collection Platform (DCP) with satellite telemetry housed in a structure mounted on top of a 24-inch diameter corrugated metal pipe stilling well with two two-inch diameter inlet pipes with flush risers. An electric drop tape is the primary reference gage.
Hydrologic Conditions.--	The basin consists of moderate terrain near the gage station, but originates in steep mountainous terrain on the Continental Divide near Thunder Mountain. In the vicinity of the gage station, the channel slope is mild and has moderate sinuosity. The channel is composed of small rock, gravel, and sand. Flow is affected by upstream reservoir releases, diversions, and the Walden water plant.
Gage-Height Record.--	Primary record is 15-minute shaft encoder transmitted data with DCP log as backup. Continuous gage height records were kept from October 1, 2010 to November 7, 2010 and April 26, 2011 through September 30, 2011. Record was not kept during the winter period. The gage was visited on 14 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. No instrument or flush corrections were necessary this water year. The record is complete and reliable except for the following dates: November 7, 2010 (shut-down); April 26, 2011 (start of data transmission following gage opening); October 27 – 29, 2010 (affected by ice); April 28, 2011 (replace DCP) and May 13-17, 20-24, July 22-29, 2011 (float malfunction). An attempt was made to open the site on April 11, 2011 but due to ice in the stilling well, actual start-up was delayed until April 26, 2011.
Datum Corrections.--	Levels were not run during WY 2011. Levels were last run on August 25, 2010.
Rating.--	The control at extreme high discharges is the Highway 125 Bridge. For lower flows, the control is a natural rock riffle located just downstream of the bridge. Rating No. 13, dated November 25, 2009, was used the entire period of record for water year 2011. It is well defined to flows of 273 cfs, 150% of the historical highest discharge measurement made in WY2005. Six measurements (numbers 88 through 93) were made this water year, ranging in discharge from 19.3 cfs to 99.4 cfs. These measurements covered the range in discharge except for lower daily flows on October 1-18, 20-22, 2010 and September 28-30, 2011 and higher daily flows on April 26 - May 2 and May 6 - August 9, 2011. The instantaneous peak flow of 1,050 cfs occurred at 1115 on June 8, 2011 at a gage height of 4.55 feet and a shift of -0.03 ft. It exceeded Measurement No. 90, made on April 11, 2011 by approximately 2.92 ft. in stage. The minimum daily flow of 9.3 cfs occurred on October 1, 2010.
Discharge.--	Shifting control method was applied throughout the period of record. Shifts were applied as defined by measurements and were distributed by time. Discharge measurements showed shifts ranging between -0.04 and 0.00 feet. Shifts were applied directly and given full weight.
Special Computations.--	The station is closed during the winter months and discharge is not estimated during this period. Discharge was estimated for November 7, 2010 (shut-down) based on partial day transmitted data and measurement 89. Flows for October 27-29, 2010 (affected by ice) were estimated based on the transmitted gage height data along with interpolation from days unaffected by ice during October 2010. April 26, 2011 discharge was estimated by averaging the 15 minute gage height data transmitted that day. April 28, 2011 discharge was estimated by interpolating the 15 minute gage height data adjacent to the missing data. Discharge from May 13-17 and May 20-24, 2011 was estimated by mimicking the hydrograph from the upstream station MICMERC0 and accounting for the time lag. Discharge from July 22-29, 2011 was estimated by interpolation between the discharge on July 21 and the discharge on July 30, 2011.
Remarks.--	The record is good, except for the period when ice on the control affected the stage-discharge relationship and should be considered fair. The partial record days when the station was shut down for the winter and started in the spring were estimated and should be considered fair. The partial day of record on April 26, 28, 2011 was estimated and should be considered fair. The period when the float malfunctioned was estimated and should be considered poor. The period May 9 - July 29, 2011 when flows exceeded 150% of the maximum measured discharge (273 cfs) at the gage should be considered poor. This includes the peak instantaneous discharge of 1,050 cfs, which should also be considered poor. Station maintained and record developed by Dan Meyer.
Recommendations.--	The bridge by the gage station should not be used for bridge measurements due to narrow width and heavy vehicle traffic. There is currently no means of making high flow measurements at this site. CDOT plans to replace the bridge over the Michigan River at this station with construction commencing in late summer 2012. A temporary gaging station was installed in October 2011 approximately 100 ft. upstream from the current station. It will be operated simultaneously with the existing gaging station until the existing station is removed during the first phase of bridge replacement construction. Levels need to be run for the temporary gage and a rating established.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06617100 MICHIGAN RIVER AT WALDEN, CO.

RATING TABLE.-- MICWLDCO13 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

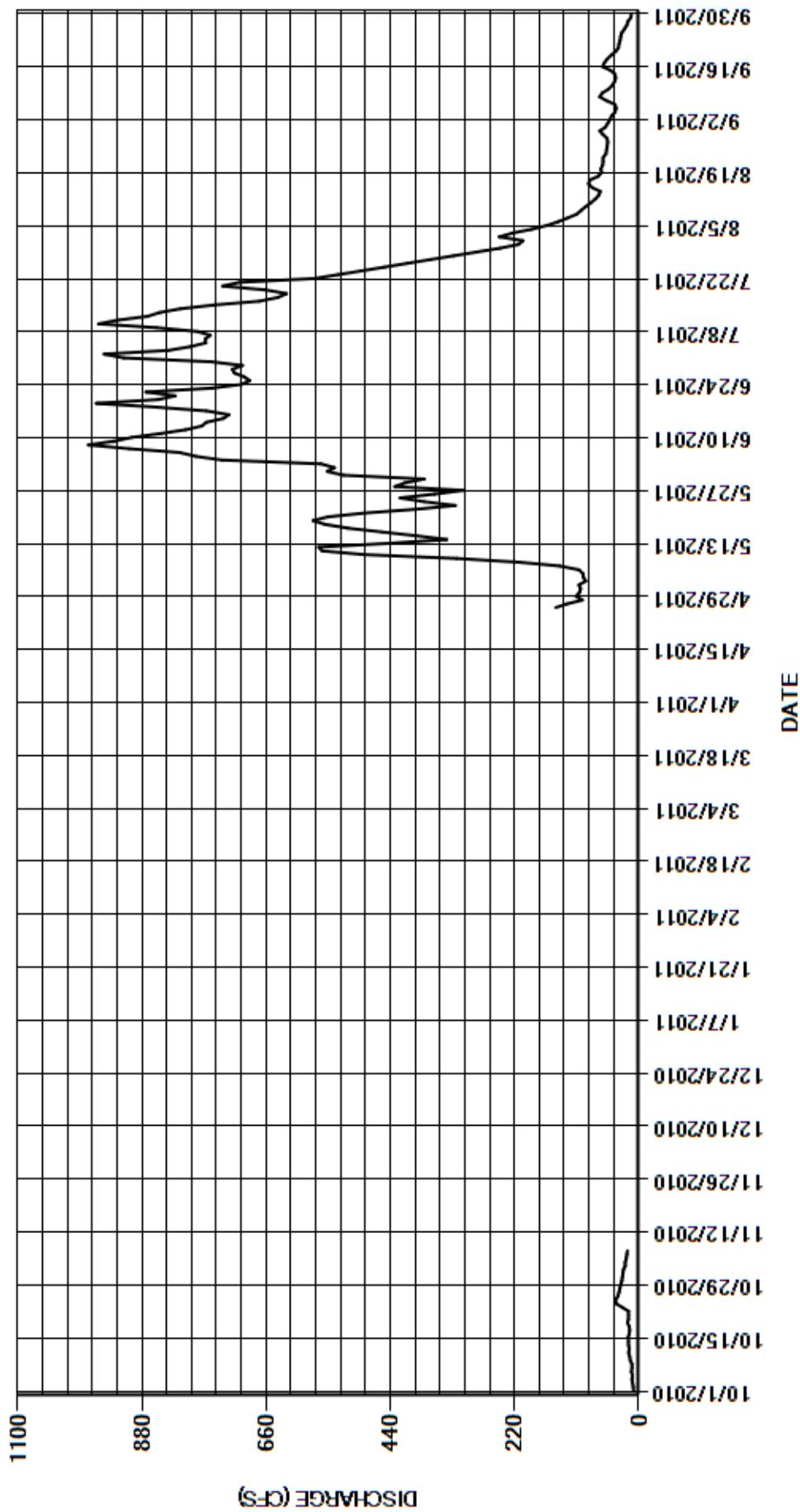
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.3	28	---	---	---	---	---	103	552	912	205	55
2	9.8	27	---	---	---	---	---	106	539	947	247	51
3	11	24	---	---	---	---	---	94	563	833	224	48
4	12	24	---	---	---	---	---	98	738	794	190	42
5	11	22	---	---	---	---	---	99	785	767	163	40
6	13	21	---	---	---	---	---	106	813	768	143	42
7	12	e20	---	---	---	---	---	140	902	759	126	57
8	12	---	---	---	---	---	---	211	975	782	110	69
9	15	---	---	---	---	---	---	323	929	854	102	65
10	16	---	---	---	---	---	---	486	898	957	94	54
11	18	---	---	---	---	---	---	561	848	923	85	47
12	17	---	---	---	---	---	---	567	803	870	77	43
13	18	---	---	---	---	---	---	e440	774	849	71	41
14	18	---	---	---	---	---	---	e340	766	812	68	42
15	19	---	---	---	---	---	---	e395	736	752	82	50
16	17	---	---	---	---	---	---	e455	726	672	89	64
17	16	---	---	---	---	---	---	e515	766	639	87	61
18	17	---	---	---	---	---	---	556	856	624	72	56
19	20	---	---	---	---	---	---	577	961	662	66	49
20	18	---	---	---	---	---	---	e550	851	737	67	41
21	18	---	---	---	---	---	---	e485	821	707	64	36
22	18	---	---	---	---	---	---	e395	873	e574	63	35
23	29	---	---	---	---	---	---	e325	757	e533	63	33
24	40	---	---	---	---	---	---	e380	704	e492	58	32
25	41	---	---	---	---	---	---	423	689	e451	57	30
26	37	---	---	---	---	---	e147	362	699	e410	56	25
27	e35	---	---	---	---	---	127	310	716	e369	55	21
28	e34	---	---	---	---	---	e100	432	720	e328	56	19
29	e32	---	---	---	---	---	111	414	702	e287	63	14
30	30	---	---	---	---	---	105	380	758	246	69	13
31	29	---	---	---	---	---	---	523	---	213	59	---
TOTAL	642.1	166	---	---	---	---	590	11151	23220	20523	3031	1275
MEAN	20.7	23.7	---	---	---	---	118	360	774	662	97.8	42.5
AC-FT	1270	329	---	---	---	---	1170	22120	46060	40710	6010	2530
MAX	41	28	---	---	---	---	147	577	975	957	247	69
MIN	9.3	20	---	---	---	---	100	94	539	213	55	13
CAL YR	2010	TOTAL	19268.6	MEAN	103	MAX	909	MIN	4.7	AC-FT	38220	(PARTIAL YEAR RECORD)
WTR YR	2011	TOTAL	60598.1	MEAN	309	MAX	975	MIN	9.3	AC-FT	120200	(PARTIAL YEAR RECORD)

MAX DISCH: 1050 CFS AT 11:15 ON JUN 08,2011 GH 4.55 FT SHIFT -0.03 FT

MAX GH: 4.55 FT AT 11:15 ON JUN 08,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06617100 MICHIGAN RIVER AT WALDEN, CO.
WY2011 HYDROGRAPH



NORTH PLATTE RIVER BASIN
06617500 ILLINOIS RIVER NEAR RAND
Water Year 2011

Location.--	Lat. 40°27'45", Long. 106°10'30", (Rand Quadrangle, 1956), in SW1/4 of the NE1/4 of Section 29, T6N, R7W in Jackson County, on right upstream bridge abutment on Jackson County Road 27.
Drainage Area and Period of Record.--	Approximately 70.6 sq. mi. (from topographic maps). Established by the State Engineer's Office. Formerly published as Illinois Creek near Rand (1931-1940) at similar location. Hydrographic measurements taken in 1981 and 1985, but no records were kept. Records kept from 1987 to present. Records published in 1995 and 2002 through the present.
Equipment.--	Sutron shaft encoder (SDI12) housed in 18-inch diameter corrugated metal pipe stilling well with two 2-inch intakes. The shaft encoder is connected via cable to a Sutron high data rate (HDR) data collection platform (DCP) with satellite telemetry. The DCP is located several feet back from the channel bank in a gray housing box. Primary reference is an outside staff gage, with a range of 0.00 to 4.33 feet, located on the bridge abutment just to the left of the well.
Hydrologic Conditions.--	The basin consists of moderate terrain near the gage station, but originates in steep mountainous terrain up at the Continental Divide. In the vicinity of the gage station, the channel slope is moderate, but has a high sinuosity. The bed material ranges from silt up to small rock approximately 4-inches in diameter. Altitude of gage is approximately 8,550 ft (from topographic map).
Gage-Height Record.--	Primary record is 15-minute shaft encoder data from satellite telemetry with the DCP log as backup. Continuous record was kept from October 1 to November 7, 2010 and April 11 to September 30, 2011. Due to weather constraints, the gage station is closed in the winter months. The gage station was visited on eleven separate occasions to ensure the instruments remained calibrated. Record is complete and reliable except for the following: October 27-28, 2010 (ice affected days); and November 7, 2010 (partial day record - station shut down for season) and April 11, 2011 (partial day record - station open for season).
Datum Corrections.--	Levels were not run during water year 2011. Levels were last run on August 25, 2010.
Rating.--	The stilling well is located upstream of the bridge at the right abutment. The channel is straight for at least 100-feet upstream to 50-feet downstream of the bridge. A small tributary joins the Illinois River just upstream of the gage station. The bridge, at times, may act as control. Otherwise, the natural channel acts as the control. Rating No. 8 in use since Apr. 21, 2010 was applied during the entire period of record this water year. Eleven measurements (numbered 113 through 123), ranging in discharge from 8.23 cfs to 562 cfs, were made this water year. These measurements covered the range in discharge except for lower daily flows of October 1-18, 2010 and higher daily flows of June 3-9, 2011. The instantaneous peak flow of 683 cfs occurred at 0945 on June 7, 2011 at a gage height of 5.10 feet and a shift of +0.74 feet. It exceeded the stage of Measurement No. 117, made on June 10, 2011 by 0.51 ft. in stage.
Discharge.--	Shifting control method was applied throughout the period of record. Shifts were applied as defined by measurements and were distributed by time and stage. Shifts were applied by time from 00:00 October 1 to November 7, 2010 and from 08:30 August 23, 2011 to the end of the water year. Shifts were distributed by stage using two variable stage-shift relationships: ILLRANCOSC04A, based on measurements 114 - 117, applied from April 11 to the peak discharge at 0945 on June 7, 2011; and ILLRANCOSC05A, based on measurements 117-122, applied from the peak discharge, June 7, 2011 until 0815 on August 23, 2011. Open-water measurements showed shifts ranging between -0.40 and +0.74 feet. Shifts were applied directly and given full weight with the exception of measurements Nos. 118, 122 and 123 which were adjusted from -5% and -2% to smooth shift distribution.
Special Computations.--	Discharge values were estimated for November 7, 2010 (shut-down) and April 11, 2011 (start-up) from the partial day record and consideration of previous and subsequent days of good record. Discharge was also estimated on the ice affected days of October 27-28, 2010. Discharge on those days was estimated by using the good record before and after the ice affected days.
Remarks.--	The record is good, except for October 27-28, 2010 and November 7, 2010 and April 11, 2011 which were estimated and are rated as poor. Station maintained and record developed by Dan Meyer.
Recommendations.--	Evaluate Rating No. 8 during water year 2012 due to significant apparent changes in the channel at both high and low flows.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

06617500 ILLINOIS RIVER NEAR RAND

RATING TABLE-- ILLRANCO08 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011
MEAN VALUES

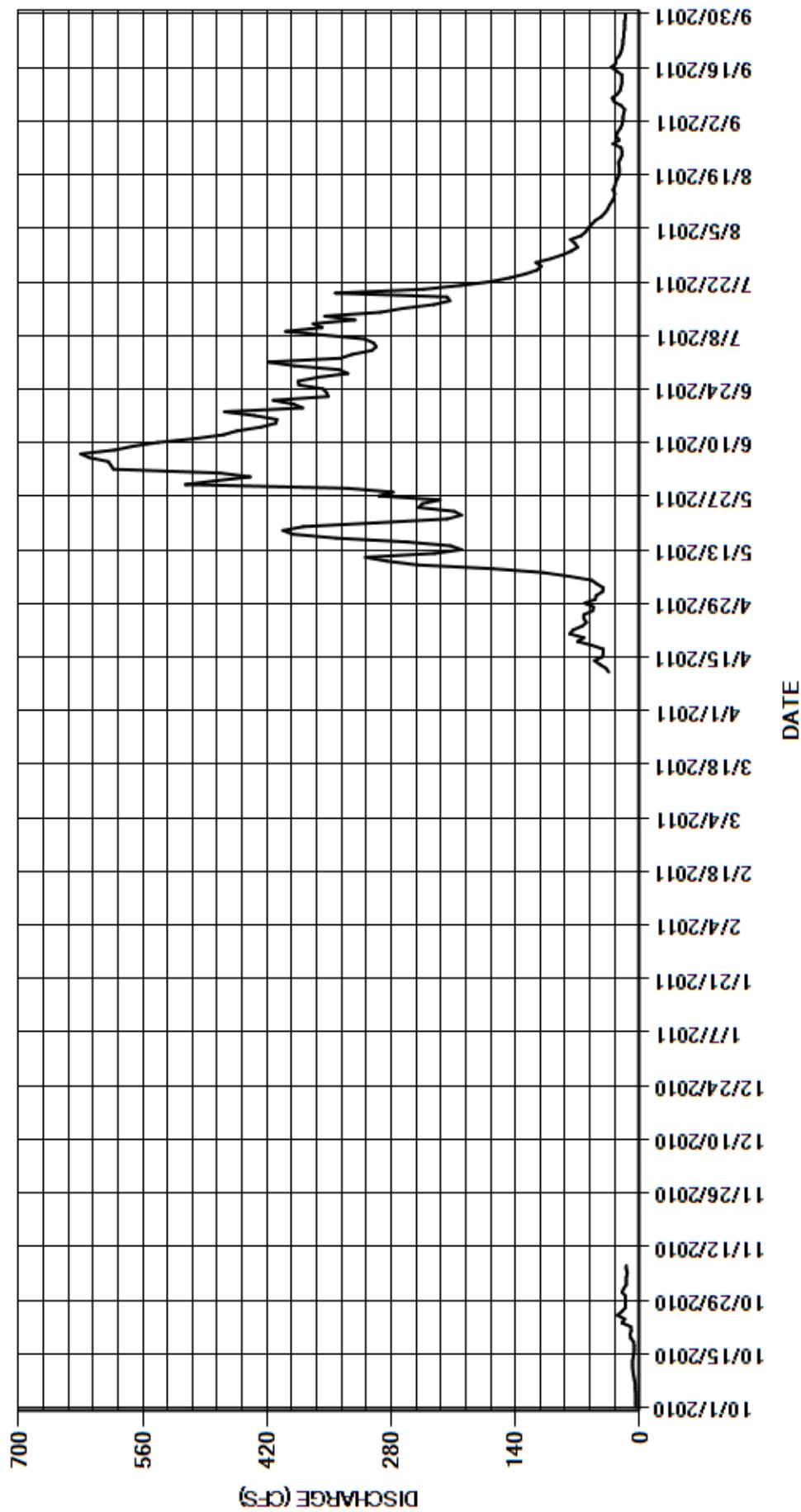
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.4	18	---	---	---	---	---	49	439	419	73	20
2	4.5	15	---	---	---	---	---	42	473	337	78	19
3	4.5	15	---	---	---	---	---	41	593	324	66	19
4	4.6	15	---	---	---	---	---	48	596	302	61	18
5	4.7	14	---	---	---	---	---	54	599	297	58	17
6	5.1	15	---	---	---	---	---	79	620	300	54	21
7	5.1	e15	---	---	---	---	---	109	630	310	50	29
8	5.9	---	---	---	---	---	---	166	592	354	43	31
9	6.6	---	---	---	---	---	---	251	571	399	39	25
10	7.5	---	---	---	---	---	---	285	543	358	36	22
11	7.9	---	---	---	---	---	e35	309	501	368	34	21
12	8.0	---	---	---	---	---	38	231	469	321	31	20
13	8.1	---	---	---	---	---	45	201	454	355	29	20
14	7.4	---	---	---	---	---	51	213	427	292	28	20
15	6.6	---	---	---	---	---	42	262	410	267	30	26
16	6.3	---	---	---	---	---	41	342	409	232	28	32
17	6.3	---	---	---	---	---	41	391	434	214	27	27
18	6.8	---	---	---	---	---	54	402	468	217	25	27
19	10	---	---	---	---	---	70	379	380	343	23	23
20	11	---	---	---	---	---	63	296	390	244	23	21
21	9.5	---	---	---	---	---	79	217	413	202	23	20
22	10	---	---	---	---	---	75	201	351	168	24	19
23	20	---	---	---	---	---	65	209	353	146	22	19
24	17	---	---	---	---	---	60	249	357	129	20	18
25	25	---	---	---	---	---	63	245	384	116	20	18
26	20	---	---	---	---	---	63	225	385	111	21	17
27	e16	---	---	---	---	---	53	294	363	117	30	17
28	e16	---	---	---	---	---	52	278	329	100	23	17
29	16	---	---	---	---	---	62	329	339	87	27	16
30	16	---	---	---	---	---	50	512	389	77	25	16
31	20	---	---	---	---	---	---	477	---	70	22	---
TOTAL	316.8	107	---	---	---	---	1102	7386	13661	7576	1093	635
MEAN	10.2	15.3	---	---	---	---	55.1	238	455	244	35.3	21.2
AC-FT	628	212	---	---	---	---	2190	14650	27100	15030	2170	1260
MAX	25	18	---	---	---	---	79	512	630	419	78	32
MIN	4.4	14	---	---	---	---	35	41	329	70	20	16
CAL YR	2010	TOTAL	12585.3	MEAN	62.6	MAX	361	MIN	3.9	AC-FT	24960 (PARTIAL YEAR RECORD)	
WTR YR	2011	TOTAL	31876.8	MEAN	151	MAX	630	MIN	4.4	AC-FT	63230 (PARTIAL YEAR RECORD)	

MAX DISCH: 683 CFS AT 09:45 ON JUN 07,2011 GH 5.10 FT SHIFT 0.74 FT

MAX GH: 5.10 FT AT 09:45 ON JUN 07,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

06617500 ILLINOIS RIVER NEAR RAND
WY2011 HYDROGRAPH



YAMPA RIVER BASIN
MORRISON CREEK BELOW SILVER CREEK
Water Year 2011

Location.--	Lat. 40°14'44", Long. 106°47'12", (Green Ridge, Colorado Quadrangle), SE1/4 of the NE1/4 in Section 10, T3N, R84W of the Sixth Principal Meridian in Routt County, approximately 200 ft. below the confluence Silver Creek.
Drainage Area and Period of Record.--	71.9 sq. mi. (from topographic maps) Established by the State Engineer's Office in October 2008. Records kept by the State Engineer's Office starting in 2009. The gage station was installed in October 2008 at the request of Upper Yampa Water Conservancy District to provide data for the proposed Morrison Creek Reservoir to be located at the gage site.
Equipment.--	Sutron shaft encoder (SDI12) connected via cable to a Sutron high data rate (HDR) data collection platform (DCP) with satellite telemetry housed in an 18-inch diameter corrugated metal pipe stilling well with two 2-inch intakes with cleanouts. Primary reference is an electric drop tape inside the well. An old staff gage remains in the creek but should not be used as a reference since its datum does not match the primary reference.
Hydrologic Conditions.--	Moderate terrain near the gage station, originates in steep mountainous terrain of the Silver Creek and Morrison Creek drainages in the Routt National Forest south of the Service Creek Wilderness Area. The channel slope is moderate and consists of gravel and small to medium size cobbles ranging from 4 to 12 inches in diameter. Some large boulders are located along the banks and in the vicinity of the bridge. Gage location is immediately downstream of the Morrison Creek bridge crossing just downstream of the confluence of Morrison Creek and Silver Creek. The channel is straight for at least 100 feet downstream of the gage. The right and left banks are subject to overflow. Altitude of gage is approximately 7880 ft (from topographic map).
Gage-Height Record.--	Primary record is 15-minute shaft encoder data from satellite telemetry with the DCP log as backup. Continuous record kept from October 1- November 5, 2010 and April 13 - September 30, 2011. The gage station is closed during the winter months. The gage station was visited eleven times during WY 2011 to ensure the instruments remained calibrated to the primary reference. Two calibration corrections were made during WY 2011. On July 1, 2011 and August 12, 2011 the shaft encoder was adjusted by +0.02 ft. to match the primary reference gage. Record is complete and reliable except for November 5, 2010 (partial day record due to gage station closure for the winter); October 1-12, 2010 and September 26-30, 2011 (backwater effect from beaver activity); October 28-29 and November 2-4, 2010 (ice affected); and, April 13-19 and April 25 - May 6, 2011 (frozen stilling well).
Datum Corrections.--	Levels were last run on October 7, 2008, when the gage was constructed. Benchmarks were established on that date.
Rating.--	At low flows the control is a natural small cobble riffle downstream of the gage. At medium flows the small cobble riffle is drowned out as the channel controls. At higher flows the channel will overbank on the right and left side of the channel which consist of willows, small shrubs and grass. The PZF in the channel is approximately 1.00 ft. Rating No. 2, dated October 8, 2008, was used from October 1, 2010 until May 7, 2011. Rating No. 3 was developed to extend the rating at the upper end to account for flows that exceeded rating No. 2. Rating No. 3 was used from May 8, 2011 to September 30, 2011. Rating definition is fair to 1,160 cfs (150% of the highest discharge measurement made at the gage). Eleven measurements (Nos. 15- 25) were made this year, ranging in discharge from 14.6 cfs to 773 cfs. These measurements covered the range in discharge except for lower daily flows on October 1-11 and 14-22, 2010, August 12-14 and 18-29, 31, September 1-5, 10-14, 20-30, 2011; and higher daily flow May 30, June 3, 5-9, 2011. The instantaneous peak flow of 896 cfs occurred at 1915 on June 7, 2011 at a gage height of 5.88 feet and a shift of 0.02 ft. It exceeded Measurement No. 19, made on June 3, 2011 by 0.38 feet in stage.
Discharge.--	Shifting control method was applied throughout the record period. Shifts were applied as defined by measurements and distributed by time. Shifts were distributed by time from October 1, 2010 to September 30, 2011 with the shift calculated on the day the station was closed applied at the time the gage was opened in April 2011. Open-water measurements showed unadjusted shifts varying between -0.21 and +0.06 feet. The shift for measurement no. 15 was affected by backwater from a beaver dam. Shifts were applied directly and given full weight, except for measurement No. 22, which was discounted 4% to smooth shift distribution.
Special Computations.--	Discharge was estimated on November 5, 2010 (partial day record due to gage station closure for the winter); October 1-12, 2010 and September 26-30, 2011 (backwater effect from beaver activity); October 28-29 and November 2-4, 2010 (ice affected); and, April 13-19 and April 25 - May 6, 2011 (frozen stilling well). Estimates were made using adjacent periods of record, discharge measurements, and hydrograph trends occurring during periods of estimated record.
Remarks.--	The record is considered fair throughout the record period. It is rated fair because the station is a recently installed gage with natural channel control and the stage-discharge relationship is not yet well defined. In addition during WY 2011 high flows exceeded the rating in use (rating No. 2) and a revised rating was extended to 1300 cfs. Station maintained and record developed by Dan Meyer.
Recommendations.--	Levels need to be run in WY2012 to establish additional reference marks, check the PZF and obtain channel cross section at the control. Continue to evaluate factors (moss, irrigation pumping, upstream diversion structures, gravel operations, sand bar, beaver dams, etc.) that are potentially contributing to shift variations at gage heights between 1.6 and 2.4 feet. Evaluate Rating No.3 at both extremes of the 2012 hydrograph and revise accordingly.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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MORRISON CREEK BELOW SILVER CREEK

RATING TABLE-- MORBSCCO02 USED FROM 01-OCT-2010 TO 07-MAY-2011
MORBSCCO03 USED FROM 08-MAY-2011 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e6.6	22	--	--	--	--	--	e68	702	319	39	9.6
2	e7.2	e20	--	--	--	--	--	e62	735	260	37	8.9
3	e7.4	e20	--	--	--	--	--	e71	794	229	29	8.6
4	e7.4	e19	--	--	--	--	--	e87	752	204	30	7.8
5	e8.8	e20	--	--	--	--	--	e98	795	184	42	9.3
6	e9.7	--	--	--	--	--	--	e167	826	169	27	17
7	e10	--	--	--	--	--	--	312	860	159	22	26
8	e12	--	--	--	--	--	--	489	831	178	20	28
9	e13	--	--	--	--	--	--	513	796	168	18	17
10	e13	--	--	--	--	--	--	388	729	155	17	13
11	e12	--	--	--	--	--	--	360	705	167	15	11
12	e16	--	--	--	--	--	--	274	696	143	14	11
13	16	--	--	--	--	--	e48	272	680	123	13	12
14	11	--	--	--	--	--	e60	381	658	102	14	12
15	10	--	--	--	--	--	e54	419	643	85	20	18
16	9.5	--	--	--	--	--	e54	497	640	76	16	23
17	9.4	--	--	--	--	--	e58	527	629	80	16	20
18	9.9	--	--	--	--	--	e74	474	616	73	13	21
19	11	--	--	--	--	--	e91	467	521	96	12	15
20	11	--	--	--	--	--	81	402	509	71	12	12
21	10	--	--	--	--	--	108	380	474	77	11	9.9
22	11	--	--	--	--	--	128	371	453	56	10	9.0
23	20	--	--	--	--	--	105	445	453	48	9.4	8.1
24	20	--	--	--	--	--	91	475	449	42	8.9	7.8
25	27	--	--	--	--	--	e92	469	439	39	8.3	7.2
26	24	--	--	--	--	--	e92	456	411	39	8.9	e6.3
27	19	--	--	--	--	--	e81	499	371	48	9.1	e5.9
28	e16	--	--	--	--	--	e77	506	339	45	8.6	e5.0
29	e24	--	--	--	--	--	e86	639	322	34	11	e5.0
30	21	--	--	--	--	--	e78	786	341	30	15	e4.7
31	23	--	--	--	--	--	--	720	--	27	12	--
TOTAL	425.9	101	--	--	--	--	1458	12074	18169	3526	538.2	369.1
MEAN	13.7	20.2	--	--	--	--	81.0	389	606	114	17.4	12.3
AC-FT	845	200	--	--	--	--	2890	23950	36040	6990	1070	732
MAX	27	22	--	--	--	--	128	786	860	319	42	28
MIN	6.6	19	--	--	--	--	48	62	322	27	8.3	4.7

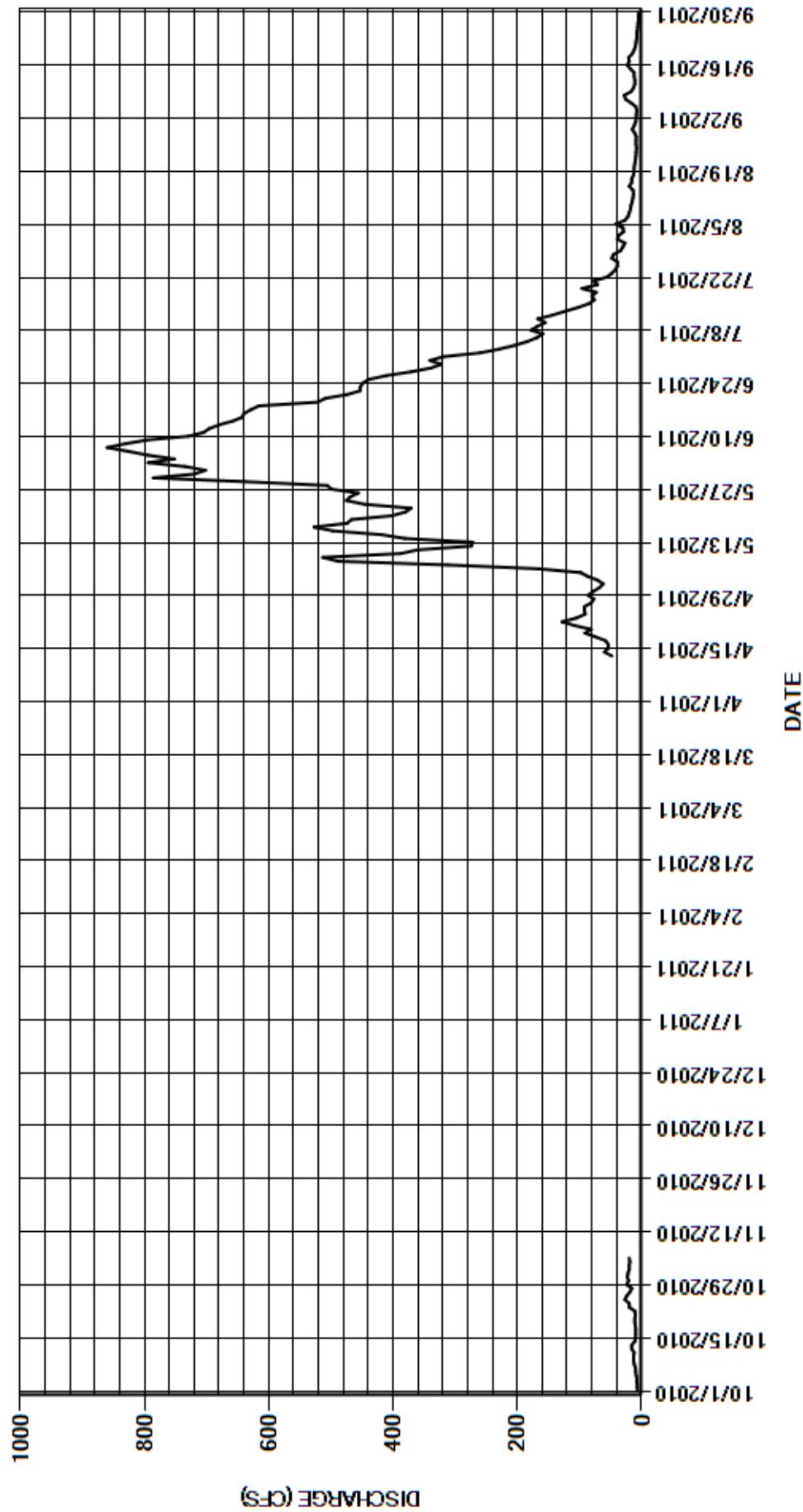
CAL YR	2010	TOTAL	16573.9	MEAN	82.9	MAX	515	MIN	3.8	AC-FT	32870 (PARTIAL YEAR RECORD)
WTR YR	2011	TOTAL	36661.2	MEAN	177	MAX	860	MIN	4.7	AC-FT	72720 (PARTIAL YEAR RECORD)

MAX DISCH: 896 CFS AT 19:15 ON JUN 07,2011 GH 5.88 FT SHIFT 0.02 FT

MAX GH: 5.88 FT AT 19:15 ON JUN 07,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

MORRISON CREEK BELOW SILVER CREEK
WY2011 HYDROGRAPH



YAMPA RIVER BASIN
YAMPA R ABOVE LAKE CATAMOUNT NR STREAMBOAT SPRINGS
Water Year 2011

Location.--	Lat. 40°20'27", Long. 106°48'29", (Blacktail Mountain, Colorado Quadrangle), SE1/4 of the SE1/4 in Section 33, T5N, R84W of the Sixth Principal Meridian in Routt County, at County Road 18C bridge.
Drainage Area and Period of Record.--	361 sq mi (from topographic maps). State Engineer maintained station. Staff gage installed at current site and datum. Spot records from staff gage kept from April 1989 to October 2003 with some years with record dating back to 1978. Continuous hydrographic records kept from October 2003 to present.
Equipment.--	Sutron shaft encoder Model 5600-0531 housed in a 42-inch diameter corrugated metal pipe shelter and well. The shaft encoder is connected to a high data rate Sutron Satlink data collection platform (DCP) with satellite telemetry. Stilling well equipped with two 1.5-inch intakes connected to flush risers. The inside staff, with a range of approximately 0.00 to 6.66 feet, is the primary reference gage and is located on the inside wall of the pipe. The station is also equipped with a stock tank heater which is used to keep the well from freezing in the winter. No other changes this water year.
Hydrologic Conditions.--	The basin consists of moderate terrain near the gage station, but originates in steep mountainous terrain up in the Flattops Wilderness Area. Discharge affected by storage and subsequent releases of Yampa River flows from Stagecoach Reservoir approximately 5 miles upstream. The channel slope is moderate and consists of small gravel and rock. Channel is straight for approximately 100 feet upstream and 500 feet downstream with a slight bend as the river passes under the bridge. Altitude of gage is approximately 6880 ft (from topographic map).
Gage-Height Record.--	Primary record is 15-minute satellite data with the DCP data log as backup. Continuous record kept from October 1, 2010 to September 30, 2011. Gage heights are recorded throughout the winter months; however, the river can be partially frozen, which in turn may result in the record being affected by ice conditions. The stilling well is generally kept ice free through use of a stock tank heater. The record is complete and reliable, except for the following days when ice on the control affected the stage discharge relationship: October 28-30, November 19, 23, 25-27, 30, December 1, 8, 9, 12, 13, 16-19, 25, 26, 28-30, 2010; January 4-17, 26, February 5-18, 22, 23, 26-28, March 1-2, 5, 14, 24, 2011; and days with more than 4 hours of missing data October 10-12, 2010 and March 13, 2011; and the days when the intake pipes were frozen: December 31, 2010, January 1-3, 2011. Shaft encoder corrections were made at the time of site visits and ranged in value from 0.19 ft to -0.05 ft.
Datum Corrections.--	Levels were not run in WY2011. Levels were last run on August 27, 2008 using the staff gage as the reference. Three other benchmarks were established at the time (RM1, RM2, and RM3).
Rating.--	Channel itself acts as the control. The right and left banks are steep and are about 6 to 8 feet high, above which flow would become sheet flow throughout a wide floodplain. Rating No. 12, in use since May 16, 2008, was used the entire water year. It is well defined to flows of 3,195 cfs, 150% of the historical highest discharge measurement made in water year 2011. Eighteen measurements (numbers 172 through 189), ranging in discharge from 68.0 to 2,130 cfs, were taken in water year 2011. These measurements covered the range in discharge except for higher daily flow on June 6-9, 2011 and lower daily flow on October 4-11, 14-22, November 17, and December 1-14, 17-19, 21, 22, 24-26, 31, 2010 and January 1-24, 31, February 1-28, March 1-9, 2011. The peak instantaneous flow of 2,490 cfs occurred at 2345 on June 6, 2011 at a gage height of 6.40 ft, with a shift of -0.20 ft. This peak exceeded the stage of Measurement 181 made on June 8, 2011 by 0.40 ft. Minimum daily flow of 47 cfs occurred on October 6 and 7, 2010.
Discharge.--	Shifting control method was applied throughout the record period. Shifts were applied as defined by measurements and were distributed by time and stage. Shifts were distributed by time from October 1, 2010 – May 29, 2011. Shifts were distributed by stage using shift curve YAMABCOVAR1 from May 29, 2011 - September 30, 2011. Open-water measurements showed shifts varying between -0.56 ft. to 0.03 ft. Shifts were applied directly and given full weight, except for Measurement Nos. 178, 180, 182-188, 190 which were discounted from -5% to +8% to smooth shift distribution.
Special Computations.--	Discharge values were estimated for those days affected by ice, inaccurate gage height, and missing data due to DCP malfunction. Estimated discharge values were computed by interpolation between adjacent good record, consideration of temperature and precipitation data from the Colorado Climate Center (Steamboat Springs, CO weather station), and by comparison to discharge record from the USGS operated and maintained gage station located upstream approximately 5 miles on the Yampa River below Stagecoach Reservoir. A shaft encoder correction of -0.02 ft was not made during the site visit on May 9, 2011 and so that correction was absorbed into the shift calculated from Measurement No. 179.
Remarks.--	The record is good, except for periods affected by ice, frozen intakes, and days with missing data. Discharge for those days was estimated and are considered fair to poor. Station maintained and record developed by Dan Meyer.
Recommendations.--	Rating No. 12 was developed after the extreme spring 2008 runoff conditions resulted in channel scouring. High, sustained runoff during WY 2011 has apparently caused deposition in the channel as evidenced by measurements with consistent negative shifts. This rating should continue to be revisited as additional measurements are made and data points become available in WY 2012. Levels should be run in WY2012.

STATE OF COLORADO
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YAMPA R ABOVE LAKE CATAMOUNT NR STREAMBOAT SPRINGS

RATING TABLE-- YAMABVCO12 USED FROM 01-OCT-2010 TO 30-SEP-2011

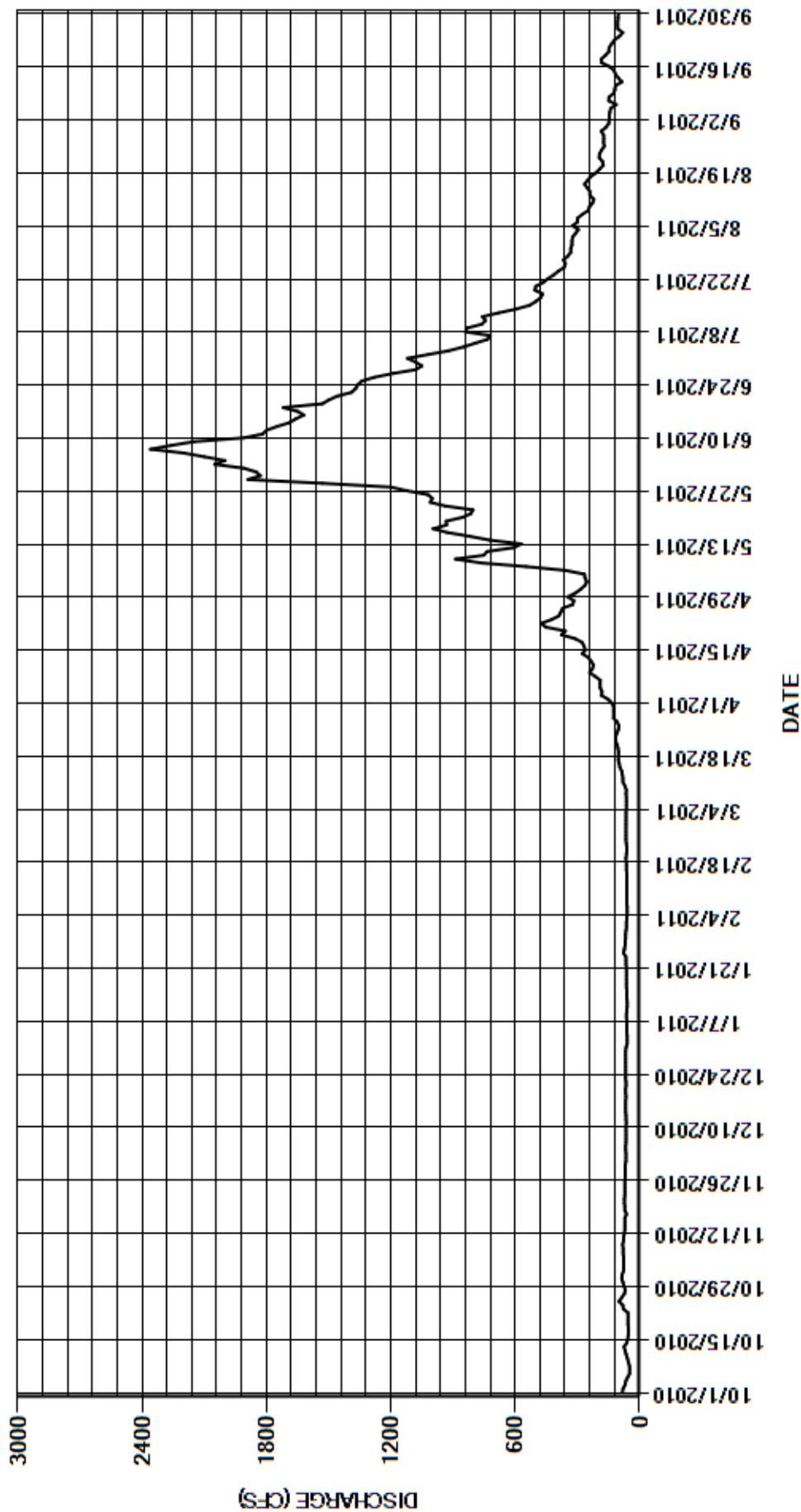
DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011												
DAY	MEAN VALUES											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	83	84	e66	e60	63	e65	134	285	1850	1120	326	149
2	79	78	66	e60	63	e65	152	264	1910	1020	323	146
3	70	77	66	e60	62	65	184	255	2050	921	309	146
4	66	78	67	e61	60	64	181	263	2000	850	295	144
5	57	77	67	e61	e60	e64	190	266	2100	793	323	139
6	47	78	66	e62	e60	64	191	357	2200	734	300	112
7	47	80	65	e62	e61	64	189	547	2360	720	299	149
8	49	79	e65	e63	e61	65	214	768	2260	840	277	147
9	54	82	e66	e63	e61	64	241	888	2150	832	248	124
10	e59	77	66	e61	e61	70	228	752	1910	762	242	119
11	e65	77	64	e60	e61	80	222	735	1820	743	227	116
12	e70	73	e65	e60	e61	80	234	608	1800	758	221	85
13	75	71	e66	e61	e61	e83	247	571	1750	681	239	102
14	62	70	67	e62	e62	e86	276	723	1690	595	239	116
15	57	70	68	e62	e62	95	262	819	1660	531	252	123
16	55	71	e68	e63	e63	98	268	927	1620	501	266	144
17	53	63	e67	e63	e63	103	277	996	1650	478	250	182
18	54	71	e66	63	e64	101	312	931	1720	467	236	185
19	56	e71	e67	63	66	101	377	933	1530	505	210	165
20	56	73	68	63	63	104	358	855	1500	501	192	148
21	55	73	65	64	62	109	451	814	1460	466	175	147
22	56	71	66	65	e62	115	476	804	1390	443	179	135
23	78	e70	68	66	e64	116	425	937	1370	415	195	122
24	81	70	67	66	66	e110	389	1010	1360	392	193	98
25	99	e70	e67	78	66	102	380	1000	1340	364	183	81
26	86	e70	e67	e73	e66	100	371	1020	1280	358	170	105
27	73	e69	68	70	e66	108	322	1120	1190	367	174	105
28	e69	69	e68	69	e66	126	317	1200	1080	346	173	105
29	e75	69	e68	68	---	124	346	1530	1050	332	174	104
30	e80	e69	e68	68	---	125	310	1890	1080	332	185	102
31	86	---	e65	65	---	125	---	1830	---	326	162	---
TOTAL	2052	2200	2063	1985	1756	2841	8524	25898	50130	18493	7237	3845
MEAN	66.2	73.3	66.5	64.0	62.7	91.6	284	835	1671	597	233	128
AC-FT	4070	4360	4090	3940	3480	5640	16910	51370	99430	36680	14350	7630
MAX	99	84	68	78	66	126	476	1890	2360	1120	326	185
MIN	47	63	64	60	60	64	134	255	1050	326	162	81
CAL YR	2010	TOTAL	67460	MEAN	185	MAX	1270	MIN	47	AC-FT	133800	
WTR YR	2011	TOTAL	127024	MEAN	348	MAX	2360	MIN	47	AC-FT	252000	

MAX DISCH: 2490 CFS AT 23:45 ON JUN 06,2011 GH 6.40 FT SHIFT -0.2 FT

MAX GH: 6.40 FT AT 23:45 ON JUN 06,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

YAMPA ABOVE LAKE CATAMOUNT NR STREAMBOAT SPRINGS
WY2011 HYDROGRAPH



YAMPA RIVER BASIN
09238500 WALTON CREEK NEAR STEAMBOAT SPRINGS, CO.
Water Year 2011

Location.--	Lat. 40 24'29", Long. 106 47'11", (Steamboat Springs, Colorado, Quad., scale, 1:24,000), in SW1/4 of the NW1/4, in Section 11, T5N, R84W, (projected), Routt County, on left bank 0.4 miles downstream from Beaver Creek, 0.6 miles downstream from Storm King Creek, 4.5 miles upstream from its confluence with the Yampa River, and 6.0 miles southeast of Steamboat Springs.
Drainage Area and Period of Record.--	42.4 sq mi (from topographic maps). Established October 1, 1920, by State Engineer's Office; re-established 0.2 mile upstream October 1, 1965, by U.S. Geological Survey; recorder installed November 10, 1965; re-established, May 20, 1982; established as water quality station October 1, 1982; re-established by the Colorado State Division of Water Resources October 1, 1995 to present.
Equipment.--	Sutron shaft encoder (SDI12) connected to a Sutron HDR data collection platform (DCP) with satellite telemetry. The encoder and DCP are housed in a 42-inch diameter corrugated metal shelter and well. The station is equipped with two 2-inch intakes connected to risers. Primary reference gage is an inside staff (range of 0.00 to 6.6 ft.) located on inner wall of 42-inch diameter corrugated metal well. An adjustable brass screw/nut on the edge of the equipment shelf is the secondary reference gage but was not used this water year. The control is a broad-crested concrete weir 50-foot long with a low flow section on the left side.
Hydrologic Conditions.--	The basin above the gage consists of steep mountainous terrain originating at the top of Mount Werner and Walton Peak. Channel slope is steep at gage location and consists of large boulders (up to approximately 3-4 feet in diameter) typical of mountainous streams. The channel is straight for 200-feet upstream to 200-feet downstream of the gage, which is located immediately upstream of the weir. The right bank is high and less subject to overflow than the left bank. Some development has occurred in the vicinity of the gage, and a large home is located above the gage location.
Gage-Height Record.--	Primary record is 15-minute satellite telemetry data with the DCP log as backup. Continuous gage height records were kept from October 1 to November 7, 2010 and April 9 to September 30, 2011. Records were not kept during the winter period (November 9, 2010 to April 7, 2011), due to site accessibility and frozen channel issues. The record is complete and reliable except for the following dates: November 8, 2010 and April 8, 2011, which were partial records due to the shut-down and start-up of the station in the Fall and Spring, respectively.
Datum Corrections.--	Levels were not run in WY2011. Levels were last run on August 27, 2008 to establish an adjustable brass screw/nut on the edge of the equipment shelf in the shelter using RM-1 as the base. Three additional reference markers were established at the same time RM 5, 6 and 7. No corrections were made.
Rating.--	The control is a 50-foot long broad-crested concrete weir with a low flow section on the left side. This section is 9-feet wide at the downstream edge and 19-feet wide at the upstream edge. Rating No. 8, developed in November 2003, and extended in June 2007, was used in WY2011. Six measurements (numbers 69 through 74) were made during the current water year, ranging in discharge from 10.3 to 28.8 cfs. They cover the range in stage experienced except for higher daily flows October 12, 25-26, 2010, April 14, April 19-30, May 4 to August 12, August 15-17, September 7, and September 15-18, 2011; and lower daily flows October 1-8, 15-18, 21, 2010 and September 4-5, 14, 26-30, 2011. The instantaneous peak flow of 1880 cfs occurred at 1915 on June 26, 2011 at a gage height of 3.04 feet, with a shift of -0.03 feet. It exceeded Measurement No. 73, made on August 16, 2011 by 2.26 ft. in stage. Minimum daily flows of 6.1 cfs occurred on October 1-5, 2010. There are no high flow measurement facilities at the gage site. Maximum stage for a safe wading measurement is about 1.20 ft (100 cfs).
Discharge.--	Shifting section control method was used throughout the period of record. Shifts were applied as defined by measurements and were distributed by time. This years' measurements had unadjusted shifts ranging between 0.00 to -0.07 feet. The shift from Measurement 71 was discounted -6% to smooth shift distribution. The stream section in the vicinity of the gage seems to be stable and so the higher negative shifts could be attributed to a change in measurement method on the concrete weir.
Special Computations.--	The station is closed during the winter months and no discharges are estimated during this period. Discharge data for November 8, 2010 (shut-down) and April 8, 2011 (start-up) were estimated using flow measurement data, partial day DCP data, and consideration of adjacent good data.
Remarks.--	The record is good, except as follows: November 8, 2010 and April 8, 2011, which were estimated and should be considered fair to poor and May 7 - August 5, 2011, which should also be considered fair to poor because the flow exceeded twice the highest WY2011 measurement. The peak flow for the year is considered poor because it exceeded 200% of the highest discharge measurement ever made at this gage of 106 cfs. This gage station is used for water administration purposes only, the rating is considered more critical during low flow periods. Station maintained and record developed by Dan Meyer.
Recommendations.--	Due to high stream velocities/depth of flow, it is highly recommended that no stream flow measurements be waded above a gage height of 1.20 feet, that chest waders be worn above a gage height of 1.00 feet, and that a second person must be on site for safety reasons. Measurements on the weir should take into account angular flow. The broad-crested weir is wide enough to take reliable measurements at its upstream edge, though safety must be considered when on the weir. A drop tape should be installed during water year 2012. The adjustable brass nut and drop tape will become the primary reference. Gage intakes should be flushed at all visits, except during peak runoff. Flush valves in well are difficult to turn without a pipe wrench, and require entry into the stilling well. Stilling well air quality should be checked when opening gage in Spring and in early Fall. An outside staff gage should be installed on left weir wing wall near terminus of stilling well intakes.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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09238500 WALTON CREEK NEAR STEAMBOAT SPRINGS, CO.

RATING TABLE-- WLTNCKCO08 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

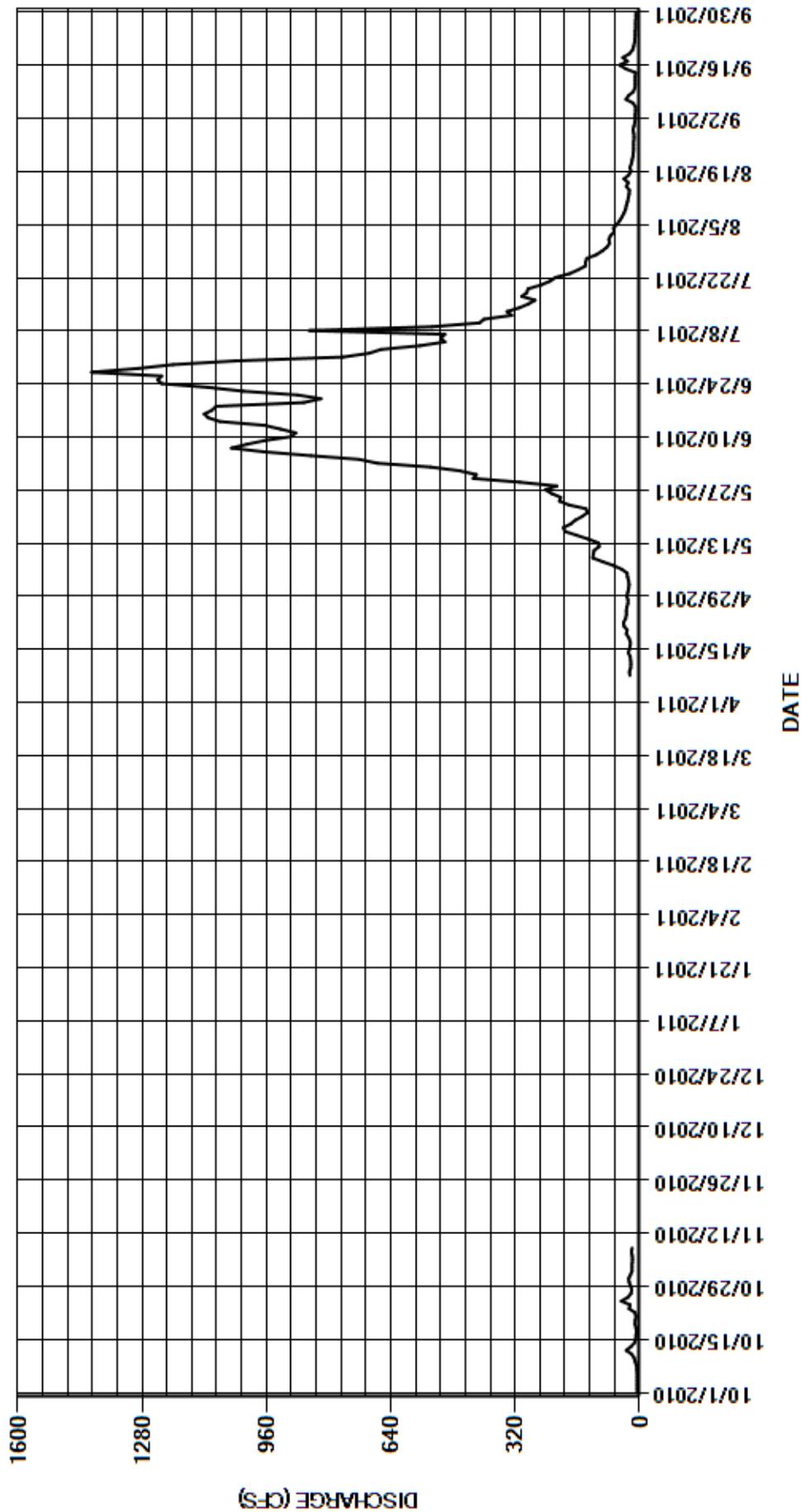
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.1	23	---	---	---	---	---	28	463	763	79	12
2	6.1	19	---	---	---	---	---	27	538	696	75	11
3	6.1	19	---	---	---	---	---	28	675	666	65	11
4	6.1	19	---	---	---	---	---	31	721	565	67	10
5	6.1	18	---	---	---	---	---	32	846	501	58	10
6	6.4	19	---	---	---	---	---	45	966	512	51	17
7	7.1	21	---	---	---	---	---	67	1050	501	45	35
8	8.1	e19	---	---	---	---	e25	94	1010	850	40	28
9	11	---	---	---	---	---	26	120	964	534	36	16
10	14	---	---	---	---	---	23	119	897	412	34	12
11	20	---	---	---	---	---	22	117	885	400	31	11
12	34	---	---	---	---	---	23	104	924	329	29	11
13	22	---	---	---	---	---	24	106	965	341	27	11
14	13	---	---	---	---	---	29	132	1080	309	26	10
15	10	---	---	---	---	---	26	162	1110	286	34	35
16	9.0	---	---	---	---	---	24	192	1120	269	29	51
17	8.4	---	---	---	---	---	24	196	1100	303	40	31
18	9.1	---	---	---	---	---	28	177	1090	290	28	43
19	12	---	---	---	---	---	34	165	864	287	22	26
20	11	---	---	---	---	---	32	147	820	254	25	18
21	9.0	---	---	---	---	---	40	134	880	231	21	15
22	12	---	---	---	---	---	41	138	1020	216	19	13
23	27	---	---	---	---	---	36	182	1110	180	17	12
24	24	---	---	---	---	---	34	206	1230	158	16	11
25	47	---	---	---	---	---	34	203	1240	140	15	11
26	30	---	---	---	---	---	33	226	1230	139	15	10
27	22	---	---	---	---	---	30	242	1410	136	15	10
28	20	---	---	---	---	---	30	213	1290	111	14	9.9
29	23	---	---	---	---	---	33	309	1200	96	15	9.6
30	27	---	---	---	---	---	30	428	1040	84	17	9.6
31	28	---	---	---	---	---	---	420	---	77	14	---
TOTAL	494.6	157	---	---	---	---	681	4790	29738	10636	1019	520.1
MEAN	16.0	19.6	---	---	---	---	29.6	155	991	343	32.9	17.3
AC-FT	981	311	---	---	---	---	1350	9500	58990	21100	2020	1030
MAX	47	23	---	---	---	---	41	428	1410	850	79	51
MIN	6.1	18	---	---	---	---	22	27	463	77	14	9.6
CAL YR	2010	TOTAL	27895.5	MEAN	135	MAX	1290	MIN	6.1	AC-FT	55330 (PARTIAL YEAR RECORD)	
WTR YR	2011	TOTAL	48035.7	MEAN	223	MAX	1410	MIN	6.1	AC-FT	95280 (PARTIAL YEAR RECORD)	

MAX DISCH: 1880 CFS AT 19:15 ON JUN 26,2011 GH 3.04 FT SHIFT -0.03 FT

MAX GH: 3.04 FT AT 19:15 ON JUN 26,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09238500 WALTON CREEK NEAR STEAMBOAT SPRINGS, CO.
WY2011 HYDROGRAPH



YAMPA RIVER BASIN
WILLOW CREEK BELOW STEAMBOAT LAKE
Water Year 2011

Location.--	Lat. 40 47'28", Long. 106 56'40", (Hahns Peak Quadrangle), in Section 29, T10N, R85W in Routt County, on left bank 50-feet below the Steamboat Lake outlet.
Drainage Area and Period of Record.--	Gage location is immediately downstream of reservoir outlet, thus flow is dictated by outlet opening position rather than drainage area runoff. The drainage area of Steamboat Lake is 35.5 square miles. Established by State Engineer's Office (SEO). Records kept from 1979 to present.
Equipment.--	Sutron shaft encoder (SDI12) housed in a steel box shelter on an 18-inch diameter corrugated metal pipe stilling well with two 2-inch intakes. The shaft encoder is connected via cable to a Sutron high data rate (HDR) data collection platform (DCP) with satellite telemetry. The DCP is located in a separate NEMA housing box several feet from the stilling well. There is no outside staff. Primary reference is an electronic drop tape referenced to a line at the base of the device, connected at the edge of the wood instrument shelf.
Hydrologic Conditions.--	The basin consists of steep mountainous terrain originating at the top of Sand Mountain, Diamond Peak, and other portions of the mountain range dividing the Elk River drainage and Little Snake River drainage. The channel slope is moderate at the gage and consists of small to medium size rock ranging from 4 to 12 inches in diameter. Releases from Steamboat Lake control the flow in Willow Creek.
Gage-Height Record.--	Primary record is 15-minute shaft encoder data from satellite telemetry with the DCP log as backup. The reservoir outlet gate valve was closed on November 12, 2010 and opened on April 30, 2011. Record was kept from October 1 to November 4, 2010 (DCP shut-down for winter) and May 2 (DCP start-up in spring) to September 30, 2011. Flow values were estimated November 4-12, 2010 and April 30 - May 2, 2011. Releases from the reservoir were kept constant during both periods of estimated record. The outlet gage height record is complete and reliable except for the following days: November 4-12, 2010 and April 30 - May 2, 2011, which were estimated. The stilling well float was installed backwards on May 2, 2011 and was fixed on May 11, 2011. Transmitted values were adjusted in the gage height record to correct for this error during that period. Two datum corrections were necessary this water year. A shaft encoder calibration of -0.01 ft was applied on October 14, 2010 and prorated back to the previous visit on August 24, 2010. A shaft encoder calibration of -0.02 ft was applied on June 15, 2011 and prorated back to May 2, 2011.
Datum Corrections.--	Levels were run to the non-adjustable screw RP on the instrument shelf on August 10, 2011 using RM3 as base. The closure error was outside of the allowable closure limit by 0.002 feet. No corrections were made to measurement gage heights. The new electric drop tape index was measured as 6.358 ft. The level used was a Sokkia C320 (S/N 445601) which passed a two peg test made on August 10, 2011. A 4 section, rectangular CST/Berger fiberglass rod was used. It was checked on August 10, 2011. Due to the closure error exceeding the allowable limit, levels should be run again in water year 2012.
Rating.--	Control is a cobble/small boulder riffle located just downstream of the gage. Gage location is immediately downstream of the Steamboat Lake reservoir outlet and flow is dictated by the outlet gate valve position. The channel slope is moderate and consists of small to medium size rock ranging from 4 to 12 inches in diameter. Channel is straight for at least 100-ft downstream of the gage. The right and left banks are subject to overflow. Rating No. 12 was used the entire period of record. It is well defined to flows of 240 cfs, 150% of the historical highest discharge measurement made in WY2005. Five measurements (numbers 100 to 104) were taken ranging in discharge from 6.48 to 48 cfs. These measurements cover the range in discharge except for lower daily flows on September 17 -30, 2011; and higher daily flows from April 30 to July 7 and July 15-20, 2011. The instantaneous peak discharge of 626 cfs occurred at 1100 on June 9, 2011 at a gage height of 4.39 ft with a shift of -0.02 ft. The peak discharge exceeded the stage of Measurement No. 102, made on July 8, 2011, by 2.64 ft.
Discharge.--	Shifting control method was applied throughout the record period. Shifts were applied directly and were distributed by time from October 1 through November 4, 2010 and from May 2 through September 30, 2011. Open-water measurements showed shifts ranging between -0.07 and -0.01 ft. All measurements were given full weight.
Special Computations.--	No water is released from the reservoir during the winter months and no outlet record is kept. Estimated values for the period in which the outlet valve was open, but the DCP shut-down, were based upon previous good data (and the knowledge that the outlet gate valve remained unadjusted during this period).
Remarks.--	Record is considered good from October 1 to November 4, 2010 and July 7 - September 30, 2011. The record is considered fair from May 2-16 and June 16 - July 6, 2011 because the flow exceeded twice the highest WY2011 measurement. The record is considered fair on days in which the flow was estimated (November 4-12, 2010 and April 30 - May 2, 2011). The record is considered poor from May 17 - June 15, 2011 because flow was in excess of 200% of the highest flow (157 cfs) ever measured at the station. The peak flow for the year is rated poor. Station maintained and record developed by Dan Meyer.
Recommendations.--	Run levels to verify RP1 and length of electric drop tape.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

WILLOW CREEK BELOW STEAMBOAT LAKE

RATING TABLE-- WILBSLCO12 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

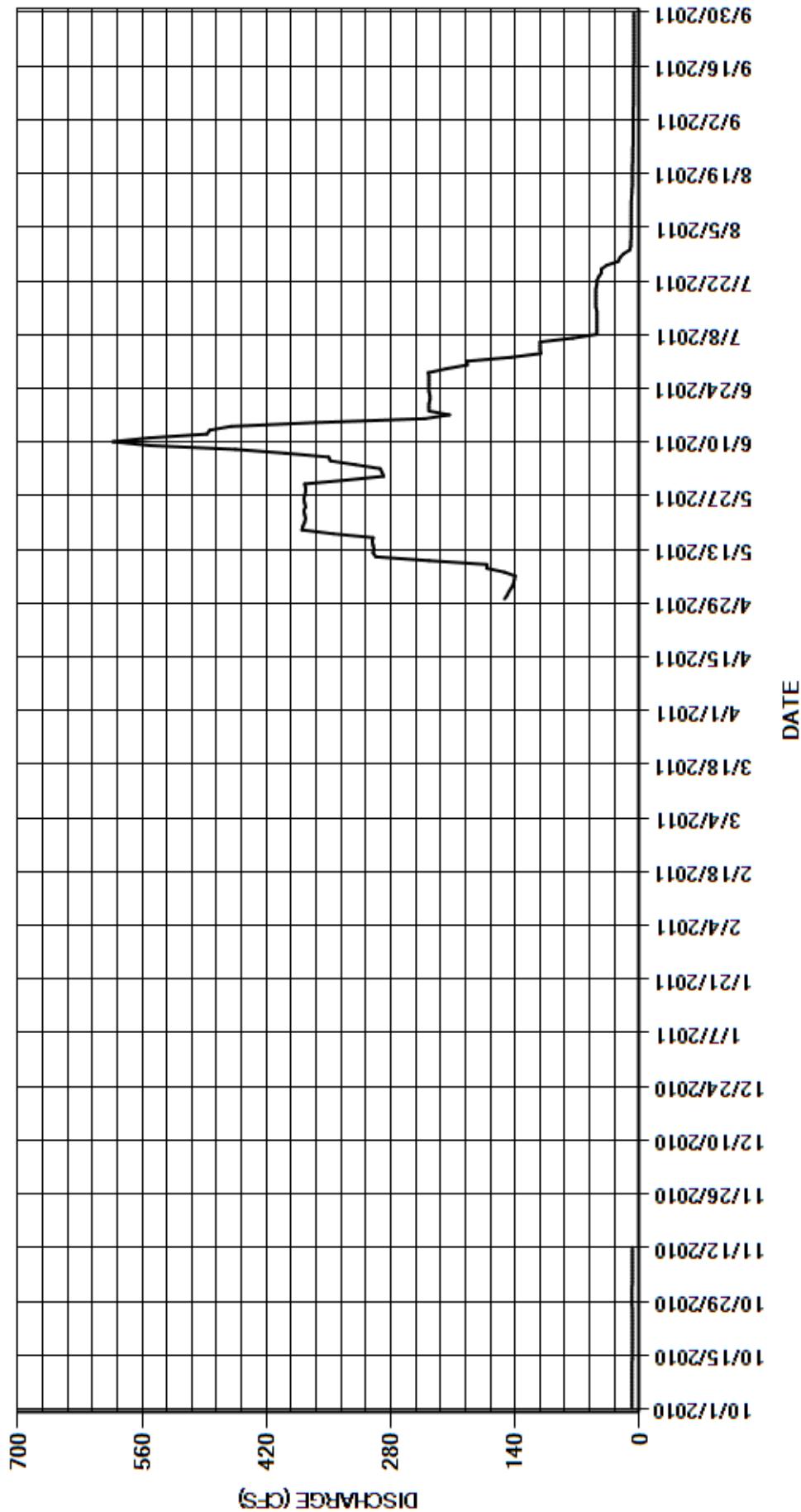
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8.4	8.4	---	---	---	---	---	e149	288	194	9.9	7.2
2	8.4	8.3	---	---	---	---	---	e147	290	145	9.5	7.2
3	8.4	8.1	---	---	---	---	---	144	292	111	9.5	7.2
4	8.4	e8.1	---	---	---	---	---	142	320	112	9.5	7.1
5	8.4	e8.1	---	---	---	---	---	141	348	112	9.5	7.1
6	8.4	e8.1	---	---	---	---	---	140	350	112	9.5	6.8
7	8.4	e8.1	---	---	---	---	---	152	399	75	9.5	6.7
8	8.5	e8.1	---	---	---	---	---	172	455	48	9.5	6.7
9	8.4	e8.1	---	---	---	---	---	172	551	48	9.3	6.7
10	8.4	e8.1	---	---	---	---	---	237	593	48	9.2	6.7
11	8.4	e8.1	---	---	---	---	---	297	552	48	9.2	6.7
12	8.4	e8.1	---	---	---	---	---	300	487	48	9.2	6.7
13	8.4	---	---	---	---	---	---	299	484	48	8.9	6.7
14	8.2	---	---	---	---	---	---	300	460	48	8.5	6.7
15	8.2	---	---	---	---	---	---	301	365	49	8.4	6.7
16	8.2	---	---	---	---	---	---	300	242	49	8.0	6.6
17	8.1	---	---	---	---	---	---	345	214	49	8.0	6.3
18	8.0	---	---	---	---	---	---	380	237	49	8.0	6.3
19	8.0	---	---	---	---	---	---	379	237	49	8.0	6.3
20	8.0	---	---	---	---	---	---	377	237	49	8.0	6.3
21	8.0	---	---	---	---	---	---	376	236	48	8.0	6.3
22	8.1	---	---	---	---	---	---	377	236	48	7.8	6.3
23	8.0	---	---	---	---	---	---	378	237	46	7.7	6.3
24	8.0	---	---	---	---	---	---	376	237	43	7.7	6.3
25	8.2	---	---	---	---	---	---	377	237	43	7.7	6.3
26	8.2	---	---	---	---	---	---	378	237	37	7.4	6.3
27	8.2	---	---	---	---	---	---	377	237	24	7.3	6.3
28	8.4	---	---	---	---	---	---	376	238	22	7.3	6.4
29	8.4	---	---	---	---	---	---	376	218	18	7.3	6.3
30	8.4	---	---	---	---	---	e152	377	194	11	7.3	6.3
31	8.4	---	---	---	---	---	---	330	---	9.9	7.3	---
TOTAL	256.3	97.7	---	---	---	---	152	8972	9708	1840.9	261.9	197.8
MEAN	8.27	8.14	---	---	---	---	152	289	324	59.4	8.45	6.59
AC-FT	508	194	---	---	---	---	301	17800	19260	3650	519	392
MAX	8.5	8.4	---	---	---	---	152	380	593	194	9.9	7.2
MIN	8.0	8.1	---	---	---	---	152	140	194	9.9	7.3	6.3
CAL YR	2010	TOTAL	13493.9	MEAN	67.1	MAX	395	MIN	5.1	AC-FT	26770	(PARTIAL YEAR RECORD)
WTR YR	2011	TOTAL	21486.6	MEAN	109	MAX	593	MIN	6.3	AC-FT	42620	(PARTIAL YEAR RECORD)

MAX DISCH: 626 CFS AT 11:00 ON JUN 09,2011 GH 4.39 FT SHIFT -0.02 FT

MAX GH: 4.39 FT AT 11:00 ON JUN 09,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

WILLOW CREEK BELOW STEAMBOAT LAKE
WY2011 HYDROGRAPH



YAMPA RIVER BASIN
WILLIAMS FORK AT MOUTH NEAR HAMILTON
Water Year 2011

Location.--	Lat. 40°26'14", Long. 107°38'50", in SE1/4 of the NW1/4 of Section 31, T6N, R91W, Moffat County, Hydrologic Unit 14050001, on left bank at coal mine service road crossing, 2,300 ft upstream from confluence with Yampa River, 6.1 mi north-northeast of Hamilton, and 8 mi south-southwest of Craig, CO.
Drainage Area and Period of Record.--	419 sq mi. Hydrographic record kept from October 1, 1983 to September 30, 2001 by the USGS and April 27, 2005 to present by the State Engineer's Office.
Equipment.--	Sutron high data rate (HDR) data collection platform (DCP) driven by a Sutron constant flow bubbler (CFB) and powered by a solar recharged 12-volt battery housed in a 6-foot square shelter over a 4-foot culvert well (no longer in use). Outside gage (the primary reference gage) is a wire weight gage (WWG) mounted on the upstream side of the bridge almost directly above the orifice.
Hydrologic Conditions.--	The basin consists of moderate terrain near the gage station but originates in steep mountainous terrain in the Flattops. In the vicinity of the gage station, the channel slope is moderate. The bed material is composed of small rock, cobbles, and occasional large boulders. The primary use of water upstream of the gage is irrigation.
Gage-Height Record.--	Primary record is 15-minute CFB data from satellite telemetry with DCP and CFB logs as backup. Continuous records were kept from October 1, 2010 through September 30, 2011. The record is complete and reliable except for the following days: December 25-26 and 28-31, 2010, January 1, 2, 4, 2011 and February 1-3, 2011 due to ice conditions; July 14 - August 10, 2011 due to unstable gage height readings (extreme noise/chatter), likely due to high flows and subsequent sediment and trash/debris loading on top of the orifice. Gage height calibration corrections for WY2011 were made at the time of site visits and ranged from -0.73 to +0.61 ft. Correction associated with measurement 68 was not made in the field.
Datum Corrections.--	Levels were run to the wire weight gage check bar and to the bottom of the wire weight on August 24, 2010 using RM6 as base. Both reference points were found to be within 0.02 ft of given elevations and no corrections were necessary. Two shots on RM4 failed the side shot tolerance test. Future levels at this gage should carefully evaluate RM4. The level used was a Sokkia C320 (S/N 445601) which passed a two peg test made on August 24 2010. A 4 section, rectangular CST/Berger fiberglass rod was used. It was checked on August 24, 2010.
Rating.--	The shelter is located upstream of the bridge on the left abutment. The orifice is located slightly underneath the bridge at the left abutment. The stream approaches the gage from a moderate left bend 300 ft upstream; the reach is then fairly straight all the way downstream to a cobble riffle, low water control 300 to 400 ft downstream of the gage. The high water control is the bridge opening. Rating No. 7 (WMFKMHCO07), created on February 9, 2006 (and extended on May 20, 2008 to include the high gage heights recorded in WY2008), was used throughout the entire water year. Twelve measurements, numbered 68 through 79, were taken during WY2011. Measurements ranged in discharge from 40.4 to 3710 cfs and covered the range in discharge, except for lower daily flows on October 1-9, 16-18, November 26 - December 15, December 17-21, 2010 and December 25, 2010 to February 4, 2011. The peak instantaneous flow of 3740 cfs occurred at 1100 on June 7, 2011 at the peak gage height of 8.89 ft with a shift of 0.00 ft. The peak gage height exceeded the stage of Measurement 74 made June 7, 2011 by 0.03 ft.
Discharge.--	Shifting control method was applied throughout WY2011. Shifts were applied as defined by measurements and were distributed by time and stage throughout the water year. Shifts were distributed by time from October 1-15 (09:30), 2010 and September 14 (12:15) - October 27, 2011. Shifts were distributed by stage using shift curve WMFKMHCOVAR01 from October 15, 2010 (09:45) to September 14, 2011 (12:00). Open-water measurements showed shifts varying between -0.12 and +0.06 ft. Shifts were applied directly and given full weight, except for measurements Nos. 70, 71, 72, 75, 76, 77, and 78 which were discounted from -5% to 5% to smooth shift distribution. Shifts after adjustment ranged between 0.00 and +0.03 ft.
Special Computations.--	Discharge values were estimated for days of uncertain/unreliable gage height record (July 14 - August 10, 2011) by evaluation of the transmitted unstable gage height data. Discharge values were also estimated for "b" (ice-affected) days (December 25-26 and 29-31, 2010, January 1, 2, 4, 2011 and February 1-3, 2011) by consideration of weather data and previous and subsequent periods of good record.
Remarks.--	The record is good except for the period of ice affected record and during the period when the CFB experienced unstable gage height readings (extreme noise/chatter). Discharge values were estimated during these periods and the record is considered poor. Station maintained and record developed by Dan Meyer.
Recommendations.--	Levels should be re-run and the PZF reassessed in WY2012. In addition, Rating No. 7 should be evaluated based upon the results of levels data and consideration of lower flows. Install radar sensor on bridge and run simultaneously with CFB to compare recorded data.

STATE OF COLORADO
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WILLIAMS FORK AT MOUTH NEAR HAMILTON

RATING TABLE-- WMFKMHCO07 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

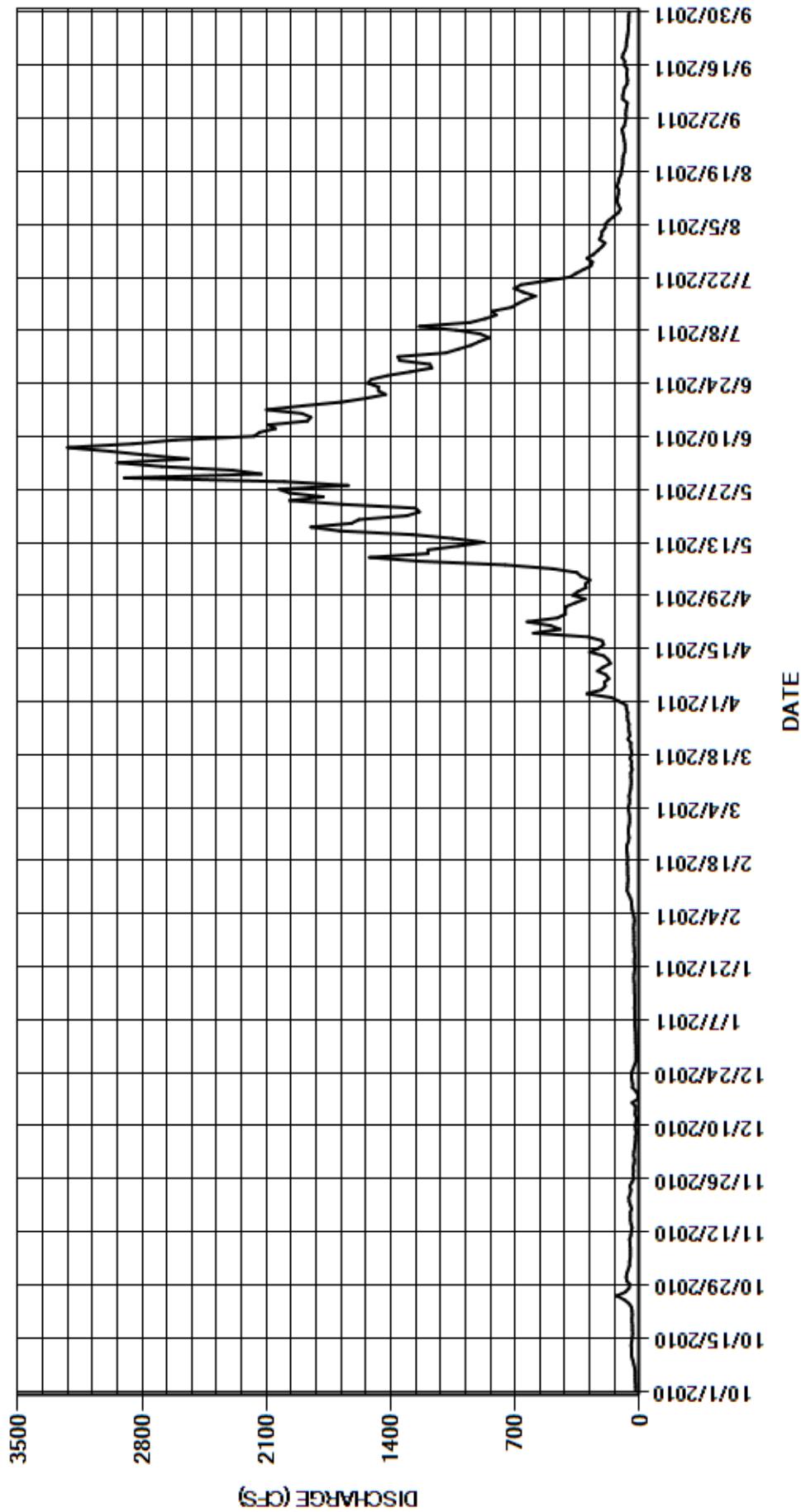
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	24	71	29	e22	e32	55	116	302	2290	1360	e226	81
2	23	64	33	e22	e29	57	159	305	2690	1090	e213	76
3	24	56	32	22	e31	61	297	279	2940	1020	e212	78
4	25	56	28	e24	36	64	215	329	2540	949	e193	77
5	26	53	26	26	42	57	193	353	2770	902	e193	73
6	25	52	23	26	44	56	198	490	2980	847	e173	69
7	28	52	24	26	45	59	173	757	3220	896	e146	94
8	33	53	19	26	51	54	189	1240	2850	1030	e120	94
9	38	54	22	27	61	50	237	1520	2610	1240	e107	89
10	44	56	25	29	70	48	206	1190	2170	956	e119	85
11	44	49	20	27	68	47	164	1190	2140	870	126	70
12	45	47	18	26	67	49	177	1020	2050	807	124	68
13	47	42	26	27	64	50	201	875	2090	832	119	71
14	44	48	23	29	66	41	281	1050	1870	e722	117	71
15	41	52	22	29	66	48	230	1280	1850	e685	128	70
16	39	52	42	29	66	44	202	1690	1900	e642	119	86
17	40	53	9.2	31	69	54	211	1850	2100	e586	115	83
18	40	44	8.1	33	68	43	287	1620	1900	e654	105	97
19	42	52	20	31	68	47	597	1580	1680	e705	102	92
20	43	59	40	28	70	51	447	1310	1540	e667	98	80
21	41	60	39	27	73	49	501	1240	1430	e528	94	75
22	42	52	43	30	71	65	632	1260	1470	e393	94	74
23	46	49	46	29	62	54	463	1670	1470	e357	92	70
24	60	55	44	26	59	59	418	1970	1530	e316	84	67
25	86	43	e36	30	62	61	419	1780	1510	e273	82	64
26	129	32	e28	30	64	59	414	1970	1420	e265	82	63
27	80	36	20	33	60	67	362	2030	1290	e296	86	62
28	60	34	e20	31	56	69	306	1640	1170	e259	89	61
29	54	36	e20	31	---	67	376	2000	1180	e236	94	60
30	72	31	e21	32	---	74	346	2900	1350	e212	99	59
31	75	---	e21	33	---	76	---	2130	---	e194	85	---
TOTAL	1460	1493	827.3	872	1620	1735	9017	40820	60000	20789	3836	2259
MEAN	47.1	49.8	26.7	28.1	57.9	56.0	301	1317	2000	671	124	75.3
AC-FT	2900	2960	1640	1730	3210	3440	17890	80970	119000	41230	7610	4480
MAX	129	71	46	33	73	76	632	2900	3220	1360	226	97
MIN	23	31	8.1	22	29	41	116	279	1170	194	82	59
CAL YR	2010	TOTAL	63701.3	MEAN	175	MAX	1710	MIN	8.1	AC-FT	126400	
WTR YR	2011	TOTAL	144728.3	MEAN	397	MAX	3220	MIN	8.1	AC-FT	287100	

MAX DISCH: 3740 CFS AT 11:00 ON JUN 07,2011 GH 8.89 FT SHIFT 0 FT

MAX GH: 8.89 FT AT 11:00 ON JUN 07,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

WILLIAMS FORK AT MOUTH NEAR HAMILTON
WY2011 HYDROGRAPH



GREEN RIVER BASIN
POT CREEK AT UTAH-COLORADO STATELINE
Water Year 2011

Location.--	Lat. 40°40'25", Long. 109°03'03", (Hoy Mountain, Utah-Colorado Quadrangle), in Section 1, T2S, R25E Salt Lake Meridian in Daggett County, on left bank approximately 0.2 miles upstream from the Utah-Colorado state line.
Drainage Area and Period of Record.--	107sq mi (from topographic maps) Established September 1, 1957 by the USGS; USGS discontinued site September 30, 1982; re-established Summer 1983 by the State Engineer's Office. Staff gage installed inside well by USGS. Two outside staff gages, one on each bank, installed by State Engineer's Office.
Equipment.--	Sutron Shaft Encoder 5600-0530, housed in a 42-inch diameter corrugated metal pipe on left bank, connected to a high data rate Sutron Satlink data collection platform (DCP) with satellite telemetry. Well is equipped with two 2-inch intakes with standard inside flushing devices. The primary reference gage is a staff gage inside stilling well. Supplemental outside staff gages are located on left and right banks but are not used for reference purposes. Backup chart recorder was not operational in Water Year 2011 (WY2011).
Hydrologic Conditions.--	Basin consists of moderate terrain near the gage station and originates in steep mountainous terrain in the Diamond and Uintah Mountain ranges. In the vicinity of the gage station, the channel slope is moderate with some sinuosity. The streambed is composed of sandstone and silt. Matt Warner, Calder and Crouse Reservoirs, located in Utah, all capture and control flow in Pot Creek upstream of gage. Irrigation diversions occur both upstream and downstream of the gage station and the river is subject to administration.
Gage-Height Record.--	Primary record is 15-minute data from the DCP data log. Continuous record kept from October 1, 2010 through September 30, 2011. The gage station was visited on 2 occasions to ensure the instruments remained calibrated. No instrument corrections were necessary this water year. Record is complete and reliable..
Datum Corrections.--	Levels have never been run by DWR personnel at this gage.
Rating.--	The control consists of an artificial weir type structure consisting of sandstone rocks grouted in place. Water pools upstream of the weir to a gage height of 0.50 ft (effective PZF=0.50 ft). Streamflow begins at gage heights exceeding 0.50 ft. Channel is straight for 100-feet upstream and bends to the left just below control before straightening for 150 feet downstream. Left bank is subject to overflow at higher stages. Right bank is almost vertical sandstone rock. Left bank covered with sagebrush and other native vegetation. This site is dry most of the year and the creek generally flows only in response to storm events, during the spring runoff period, and at times when water is released from upstream reservoirs in Utah. Due to weather constraints, the site is inaccessible during most of the year, including the late fall, winter and early spring months, which includes most periods when flow is recorded at the site during a typical water year. Rating No. 6 was created on November 16, 2005 and used for WY2011. Flow was recorded at the site on 118 days during WY2011: October 25, December 19-20, and December 22-24, 2010; March 10-22, March 28, March 31- May 7, May 9 - June 26 and June 28 - July 8, 2011. Zero flow (247 days) was recorded on the remaining days in WY2011. Two measurements (Nos. 22 and 23) were made this year on May 26, 2011 at flows 7.90 cfs and 8.26 cfs respectively. Observations of zero flow were made on October 21, 2010 and October 14, 2011. The measurement and observations of zero flow cover the range in stage, except for higher daily flows recorded on May 28 and May 31-June 11. The peak flow of 32 cfs occurred at 0915 on June 1 at a gage height of 1.67 ft. and a shift of -0.02 ft. That peak flow exceeded the high flow measurement gage height by 0.53 ft.
Discharge.--	Shifts were distributed by time throughout WY2011, based upon Measurements 22 and 23 along with observed zero flow in WY2011.
Special Computations.--	No discharges were estimated during the flow period of WY2011.
Remarks.--	The record is considered fair throughout the record period because only two flow measurements on the same day could be made during WY2011. Station maintained and record developed Dan Meyer.
Recommendations.--	Levels need to be run at this site. Handrails should be added to platform.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

POT CREEK AT UTAH-COLORADO STATELINE

RATING TABLE-- PTCKSLCO06 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

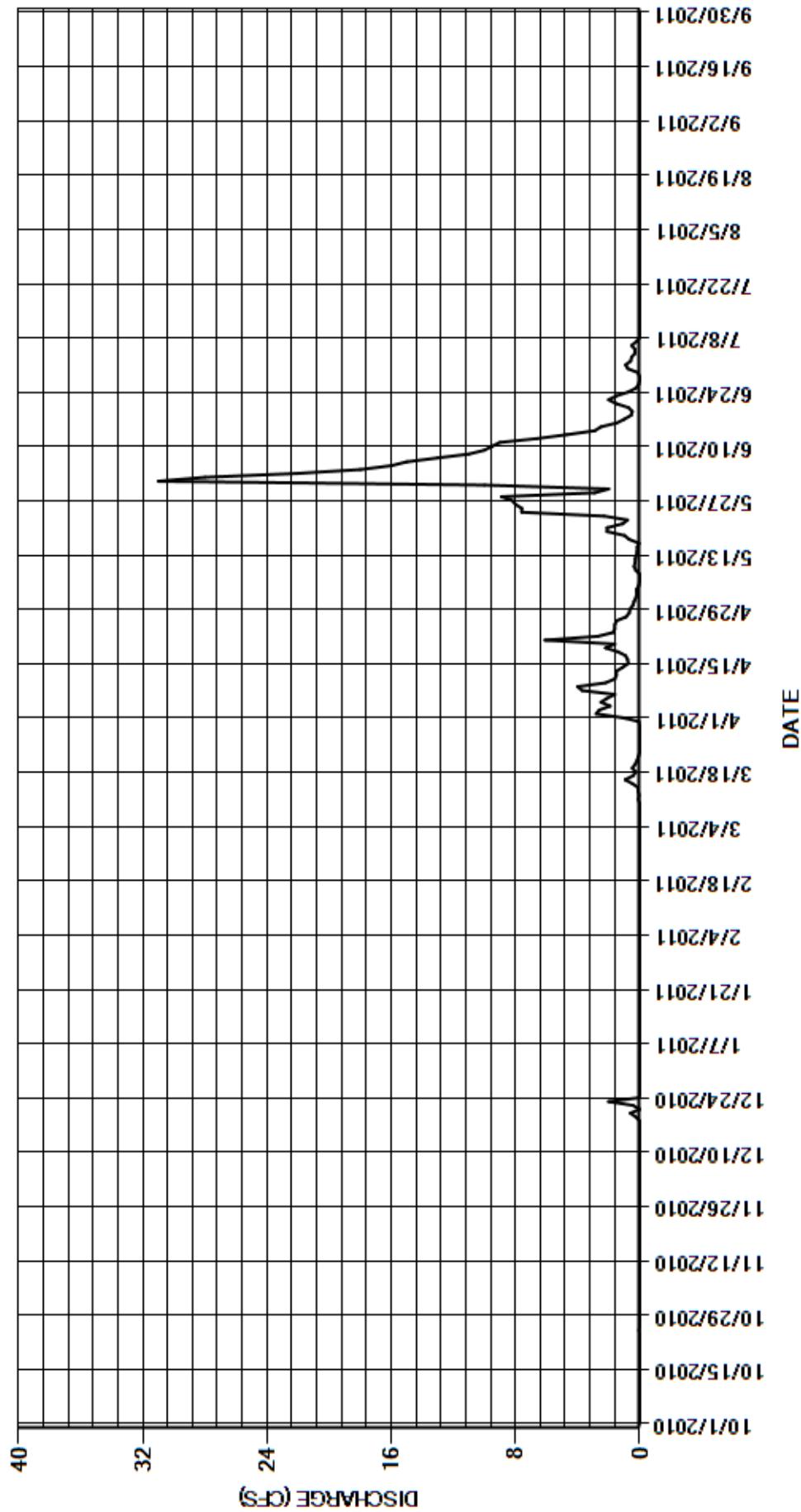
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	1.1	0.36	31	0.91	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	2.8	0.24	28	0.58	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	2.6	0.18	22	0.52	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	1.9	0.22	18	0.30	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	2.5	0.06	16	0.30	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	2.1	0.01	15	0.52	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	1.6	0.01	13	0.22	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	3.7	0.00	11	0.01	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	4.0	0.25	10	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.01	2.2	0.36	9.5	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.08	1.6	0.30	9.0	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.04	1.5	0.29	6.6	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.10	1.5	0.20	4.7	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.11	1.1	0.17	2.9	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.47	0.74	0.16	2.5	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.94	0.78	0.04	1.5	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.44	0.91	0.68	0.99	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.24	1.4	0.98	0.55	0.00	0.00	0.00
19	0.00	0.00	0.24	0.00	0.00	0.48	2.2	2.1	0.48	0.00	0.00	0.00
20	0.00	0.00	0.60	0.00	0.00	0.29	1.6	2.1	0.73	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.17	6.1	1.1	1.5	0.00	0.00	0.00
22	0.00	0.00	0.43	0.00	0.00	0.08	2.7	0.79	2.0	0.00	0.00	0.00
23	0.00	0.00	2.0	0.00	0.00	0.00	1.7	2.3	1.5	0.00	0.00	0.00
24	0.00	0.00	0.03	0.00	0.00	0.00	1.6	7.6	0.74	0.00	0.00	0.00
25	0.03	0.00	0.00	0.00	0.00	0.00	1.6	7.6	0.25	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	1.5	8.0	0.06	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.88	8.2	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.01	0.68	8.9	0.01	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.62	2.9	0.11	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.44	2.0	0.76	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.05	---	10	---	0.00	0.00	---
TOTAL	0.03	0.00	3.30	0.00	0.00	3.51	55.65	68.10	210.38	3.36	0.00	0.00
MEAN	0.001	0.000	0.11	0.000	0.000	0.11	1.86	2.20	7.01	0.11	0.000	0.000
AC-FT	.06	0	6.5	0	0	7.0	110	135	417	6.7	0	0
MAX	0.03	0.00	2.0	0.00	0.00	0.94	6.1	10	31	0.91	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.44	0.00	0.00	0.00	0.00	0.00
CAL YR	2010	TOTAL	133.63	MEAN	0.37	MAX	14	MIN	0.00	AC-FT	265	
WTR YR	2011	TOTAL	344.33	MEAN	0.94	MAX	31	MIN	0.00	AC-FT	683	

MAX DISCH: 32 CFS AT 09:15 ON JUN 01,2011 GH 1.67 FT SHIFT -0.02 FT

MAX GH: 1.67 FT AT 09:15 ON JUN 01,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

POT CREEK AT UTAH-COLORADO STATELINE
WY2011 HYDROGRAPH



SAN JUAN RIVER BASIN
DOLORES TUNNEL OUTLET NEAR DOLORES
Water Year 2011

Location.--	Lat. 37°28'00", Long. 108°32'30", in SW 1/4 SE 1/4 sec. 18, T. 37 N., R.15 W., NMPM, Montezuma County.
Drainage Area and Period of Record.--	N/A
Equipment.--	Sutron Satlink 2 high data rate DCP with a shaft encoder in a concrete shelter and well. The primary reference gage is an electric drop tape. The shaft encoder was upgraded to a Sutron stage-discharge recorder (SDR) on Sept. 29, 2011. The control is a 15 ft. concrete Parshall flume located approximately 80 ft. below the outlet of the tunnel.
Hydrologic Conditions.--	Water from McPhee Reservoir is released through the Dolores Tunnel where it is outlet into a straight vertical concrete wall channel that is 25-ft wide. The converging section of the concrete Parshall flume is located approximately 80 ft. downstream of the tunnel outlet. Surging occurs in the converging section due to the close proximity of the tunnel outlet and Parshall flume.
Gage-Height Record.--	The primary record is 15-minute shaft encoder/SDR data downloaded from satellite telemetry with the DCP download used as backup. The gage was visited on 11 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted 1 time this water year (Feb 23, 2011). The adjustment made was +0.01 feet. No flush corrections were made this water year. Record is complete and reliable for the entire period of record. Two 15-min punches were missed at 1200 and 1215 on 9/29/11 during the installation of the SDR. Gage height was estimated across this period.
Datum Corrections.--	Levels have not been run at this gage. The datum corrections noted on the measurement sheets are corrections or confirmations of the shaft encoder readings and flush corrections made as a result of visits to the gage by State of Colorado hydrographers.
Rating.--	The control is a 15-foot concrete Parshall Flume. A non-standard Parshall flume rating is used. Moss in the flume can cause shifting. Rating 03, dated Oct. 29, 2009, was used for the entire water year. It is fairly well defined from 3.50 cfs to 360 cfs. Ten measurements, Nos. 95-104, were made this year ranging in discharge from 3.15 cfs to 322 cfs. They cover the range-in-stage experienced except for the lower daily flows of Nov. 19, 22, 24, 2010, and higher average daily flows of May 15-16; Jun. 2-6, 18, 21-30; Jul. 1-14, 2011. The peak discharge for the year of 383 cfs occurred at 1845 on June 2, 2011, at a gage height of 3.12 ft., and a shift of 0.00 ft. The gage height at that time exceeded the gage height of measurement No. 101 by 0.32 ft in stage.
Discharge.--	Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by stage and prorated by time. A 0.00 ft shift was continued from Oct. 1, 2010 through Oct. 20, 2010. Shifts were prorated by time (0.00 ft to +0.02 ft) from Oct 20 through Oct 28 when the diversion rate dropped to winter levels. Variable stage shift relationship, DOLTUNCOVS11A, was applied from Oct 28, 2010 through Apr 29, 2011. Shifts for the summer were then prorated by time from Apr 29 through Aug 29 to reflect moss growth in the flume. Shifts were prorated by time (+0.04 ft to 0.00 ft) to Oct 4, 2011 to reflect the shift shown in measurement in conjunction with lower discharge rates. Shift Curve DOLTUNCOVS12A was used from Oct 4, 2011 through the end of the irrigation year (Oct. 31, 2011 @2345). Open-water measurements showed shifts varying from +0.04 to -0.02 feet. Shifts were applied directly and given full weight, except for measurement numbers 95 and 99 which were discounted 1% to -2% respectively to smooth shift distribution. Measurement No. 98 was not used in the shift distribution. The shift indicated that the measurement was compromised, possibly by moss in the meter.
Special Computations.--	No special computations were needed this water year.
Remarks.--	Record good. Station operated and maintained by Brian Leavesley. Record developed by Brian Leavesley.
Recommendations.--	Levels should be run in water year 2012.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

DOLORES TUNNEL OUTLET NEAR DOLORES

RATING TABLE.-- DOLTUNCO03 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

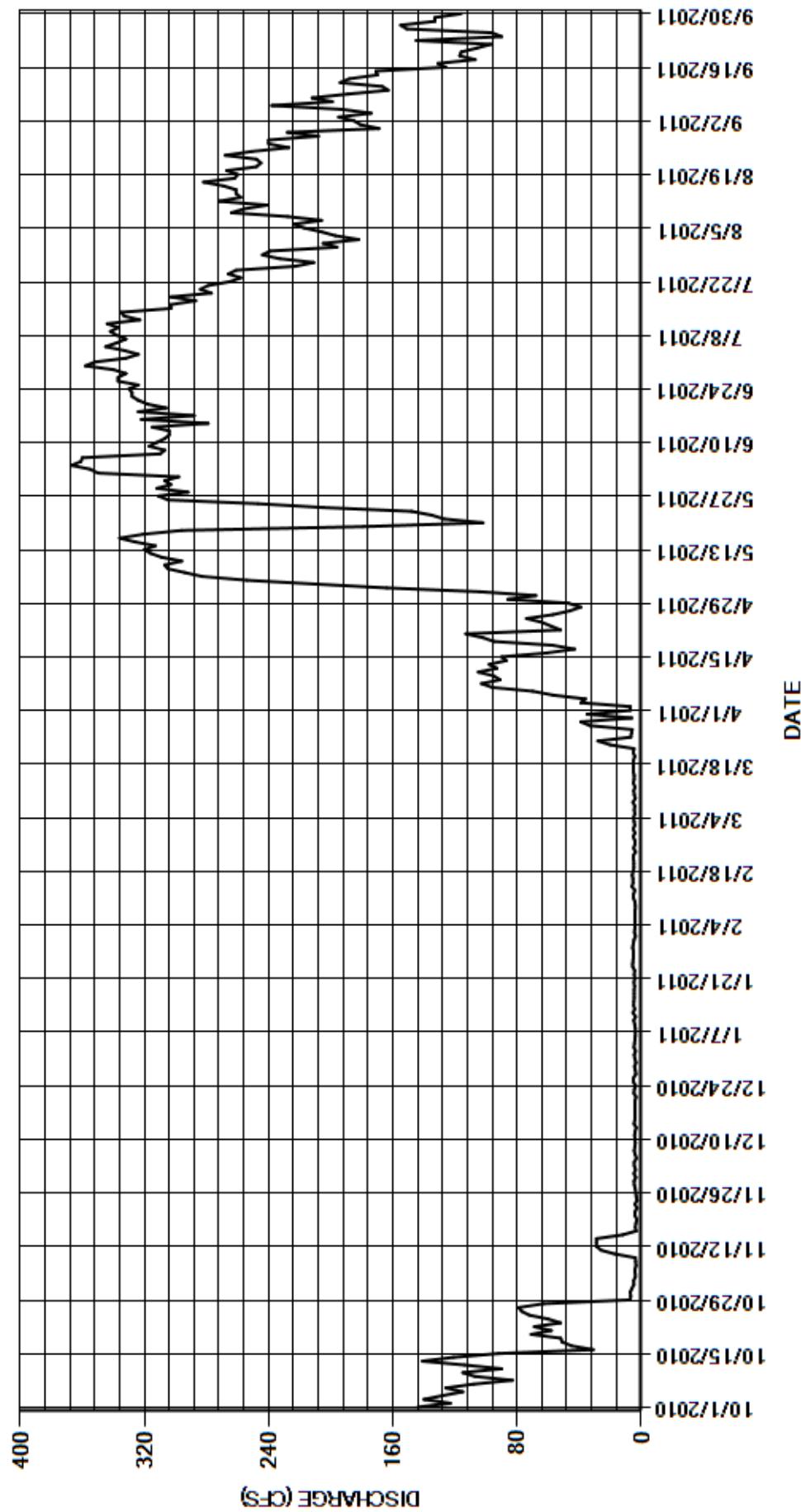
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	144	6.1	4.8	4.6	3.7	5.3	7.2	68	298	352	205	181
2	123	4.8	3.7	3.7	4.5	4.2	7.1	104	350	332	182	185
3	140	5.0	4.5	4.8	4.2	4.7	39	164	355	324	197	195
4	128	3.9	4.6	4.4	4.2	5.0	36	210	367	333	206	174
5	115	4.0	3.2	4.1	4.2	4.2	57	254	361	345	217	193
6	126	4.1	4.0	3.9	4.2	4.6	70	283	360	338	224	238
7	108	3.4	4.6	3.9	4.2	4.2	96	294	310	332	206	199
8	83	3.7	4.2	3.9	4.0	5.4	103	305	307	338	228	212
9	107	3.8	3.9	4.3	3.9	3.9	91	307	317	342	264	189
10	115	17	4.2	4.9	4.1	4.6	95	296	312	337	256	163
11	90	26	4.3	3.7	5.1	4.9	105	309	307	344	241	167
12	114	29	4.1	5.4	5.0	4.1	93	316	304	323	272	194
13	141	29	3.3	4.2	4.2	5.2	98	320	304	333	258	188
14	121	29	4.7	5.0	6.1	4.7	87	313	315	335	261	170
15	92	12	4.2	4.8	5.3	4.6	90	326	279	303	261	171
16	31	3.3	4.2	4.6	5.4	5.3	61	336	322	303	269	126
17	45	3.9	4.2	4.6	5.9	5.0	43	321	288	287	282	131
18	51	3.5	4.2	4.6	5.2	5.0	57	296	324	303	262	107
19	52	2.9	4.2	4.4	4.8	5.0	95	179	306	277	260	117
20	71	4.1	4.2	4.8	4.8	4.2	102	102	318	284	267	116
21	58	4.2	3.4	4.2	5.0	5.3	113	127	324	279	248	106
22	69	2.8	4.8	4.6	5.3	4.7	52	135	328	265	245	97
23	52	4.2	4.5	4.3	3.7	20	58	148	328	258	248	145
24	60	2.8	3.7	5.5	5.0	28	64	205	330	266	268	90
25	72	3.3	5.2	5.5	4.1	6.8	74	247	324	261	251	96
26	77	3.6	5.0	5.3	4.2	6.4	57	305	337	223	227	151
27	79	3.9	3.5	5.1	5.3	5.9	46	311	337	211	240	155
28	63	4.5	3.9	5.0	4.1	33	39	292	332	233	240	133
29	7.2	4.7	4.4	5.6	---	39	47	312	340	244	208	133
30	6.9	3.6	3.5	5.2	---	6.1	86	303	358	239	228	116
31	7.2	---	4.2	4.8	---	35	---	307	---	196	169	---
TOTAL	2548.3	236.1	129.4	143.7	129.7	284.3	2068.3	7795	9742	9140	7390	4638
MEAN	82.2	7.87	4.17	4.64	4.63	9.17	68.9	251	325	295	238	155
AC-FT	5050	468	257	285	257	564	4100	15460	19320	18130	14660	9200
MAX	144	29	5.2	5.6	6.1	39	113	336	367	352	282	238
MIN	6.9	2.8	3.2	3.7	3.7	3.9	7.1	68	279	196	169	90
CAL YR	2010	TOTAL	44791.8	MEAN	123	MAX	359	MIN	2.3	AC-FT	88840	
WTR YR	2011	TOTAL	44244.8	MEAN	121	MAX	367	MIN	2.8	AC-FT	87760	

MAX DISCH: 383 CFS AT 18:45 ON JUN 02,2011 GH 3.12 FT SHIFT 0 FT

MAX GH: 3.12 FT AT 18:45 ON JUN 02,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

DOLORES TUNNEL OUTLET NEAR DOLORES
WY2011 HYDROGRAPH



SAN JUAN RIVER BASIN
LONE PINE CANAL BELOW GREAT CUT DIKE NEAR DOLORES
Water Year 2011

Location.--	Lat. 37°30'24", Long. 108°35'28", in NW 1/4 SW 1/4 sec. 35, T.38 N., R.16 W., NMPM, Montezuma County, Hydrologic Unit 14080202, on the right bank 550 ft. downstream from the Great Cut Dike of McPhee Reservoir.
Drainage Area and Period of Record.--	Drainage Area - N/A. Diversion record Nov. 1, 1987 to present. Published streamflow record Oct. 1, 1993 to present.
Equipment.--	Sutron 8210 high data rate DCP and an analog shaft encoder were replaced on Sept. 29, 2011 with a Sutron Satlink 2 DCP and Sutron Stage-Discharge Recorder (SDR). Shaft encoder/SDR is set to outside staff gage. The electronic equipment is located in a concrete shelter and well. Control is a 12-foot concrete Parshall flume. A foot bridge is located at the throat of the flume where a bridge crane is used to make high flow measurements. No other changes this water year.
Hydrologic Conditions.--	The canal is filled by gravity from McPhee Reservoir. The channel upstream and downstream of the Parshall flume is straight. At high flows (GH > 2.50-ft) the canal surges and the approach velocity to the flume is fast. During the water year, some moss does grow in the channel above the flume and on the flume floor itself.
Gage-Height Record.--	The primary record is 15-minute shaft encoder/SDR data downloaded from satellite telemetry with DCP downloaded data used for backup purposes. Upon station inspection on Feb 23, 2011, it was discovered that the shaft encoder tape had become dislodged from the pins on its wheel. When the tape was placed back on the pins, a gage height correction of -0.03 ft was shown (0.20' --> 0.17'). The tape has been known to come off of its pins when the water level within the stilling well changes rapidly. A datum correction was not applied to the gage height record as it was believed that this dislodging occurred when the canal was shut off on Feb 7, 2011. The 0.20 ft. gage height is still a zero discharge. The intake to the stilling well isolates when the gage height is below 0.20 ft. Flows below a gage height of 0.20 ft. are negligible and a 0 flow is assigned to them. GH corrections due to SE/SDR calibration to the staff gage occurred three times over the water year: +0.03 ft. on Apr 8, 2011, -0.01 ft. on May 17, 2011, and -0.01 ft. on Aug 29, 2011. Gage height record is complete and reliable except for Sep 29, 2011 when the SE was replaced with the SDR and more than 4 hours of 15-min. values were missed.
Datum Corrections.--	Levels were run in water year 2011 on Oct 6, 2010. This was the first time levels have been run at this site. BM#1 was established as the floor of the flume at the outside staff gage as 0.00 ft. elev. There is no physical reference point within the gage house. An electric tape is planned to be installed in WY2012. The top of the instrument shelf inside the gage house was found to be 9.78 ft above BM#1. No corrections were made to the record in WY11.
Rating.--	A nonstandard 12-ft. concrete Parshall flume rating 03 (MVIDIVCO03 dated 10/8/2010) in use since Feb 18, 2010, was used for the entire water year. Rating 03 is fairly well defined from 20 cfs to 475 cfs. Eleven discharge measurements (Nos. 89-99) were made this year ranging in discharge from 37.7 cfs to 189 cfs. Observations of zero-flow were made on Oct 6 and Nov 1, 2010. The measurements and observations of zero-flow cover the entire range-in-stage experienced except for the higher average daily flows of May 31; June 1-2, 7-9, 17-22, 2011. The instantaneous peak flow of 244 cfs occurred at 1045 on 5/31/2011 at a gage height of 2.74 ft. with a shift of 0.00 ft. The peak flow exceeded high measurement 97 (GH = 2.34 ft.) by 0.40 ft. in stage.
Discharge.--	Shifts for WY11 were applied by time for the entire water year. All measured shifts were adjusted to the rating (0.00 ft. shift). Measurements were discounted -8% to +5%. All measurements made in WY2011 (nos. 89-99) were discounted except for meas. nos. 93 and 94 which were measured as 0.00 ft. shift. It has been shown in WY10 that measurement at the gage within the flume showed a trend of positive shifts while measurements (when possible) within the channel above the flume would show less positive to negative shifts, even with measurements performed in succession on the same day.
Special Computations.--	No special computations this WY.
Remarks.--	Record is 'fair' for the entire period. A 'fair' rating was given due to the uncertain relationship between stage and discharge as demonstrated through measurements at and above the gage, even in succession on the same day and same stage, showing a broad range in discharge. However, Rating 03 that was instituted WY2010 has shown a closer fit to measured discharge at and above the gage. Station maintained and record developed by Brian Leavesley.
Recommendations.--	An electric tape or drop tape should be installed. A station visit should be performed after all significant changes in water stage to ensure the tape on the shaft encoder has not migrated from its pins on the wheel. Multiple measurements on the same day with the same stage should be performed in order to better determine the stage-discharge relationship at the gage.

STATE OF COLORADO
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LONE PINE CANAL BELOW GREAT CUT DIKE NEAR DOLORES

RATING TABLE.-- MVIDIVCO03 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

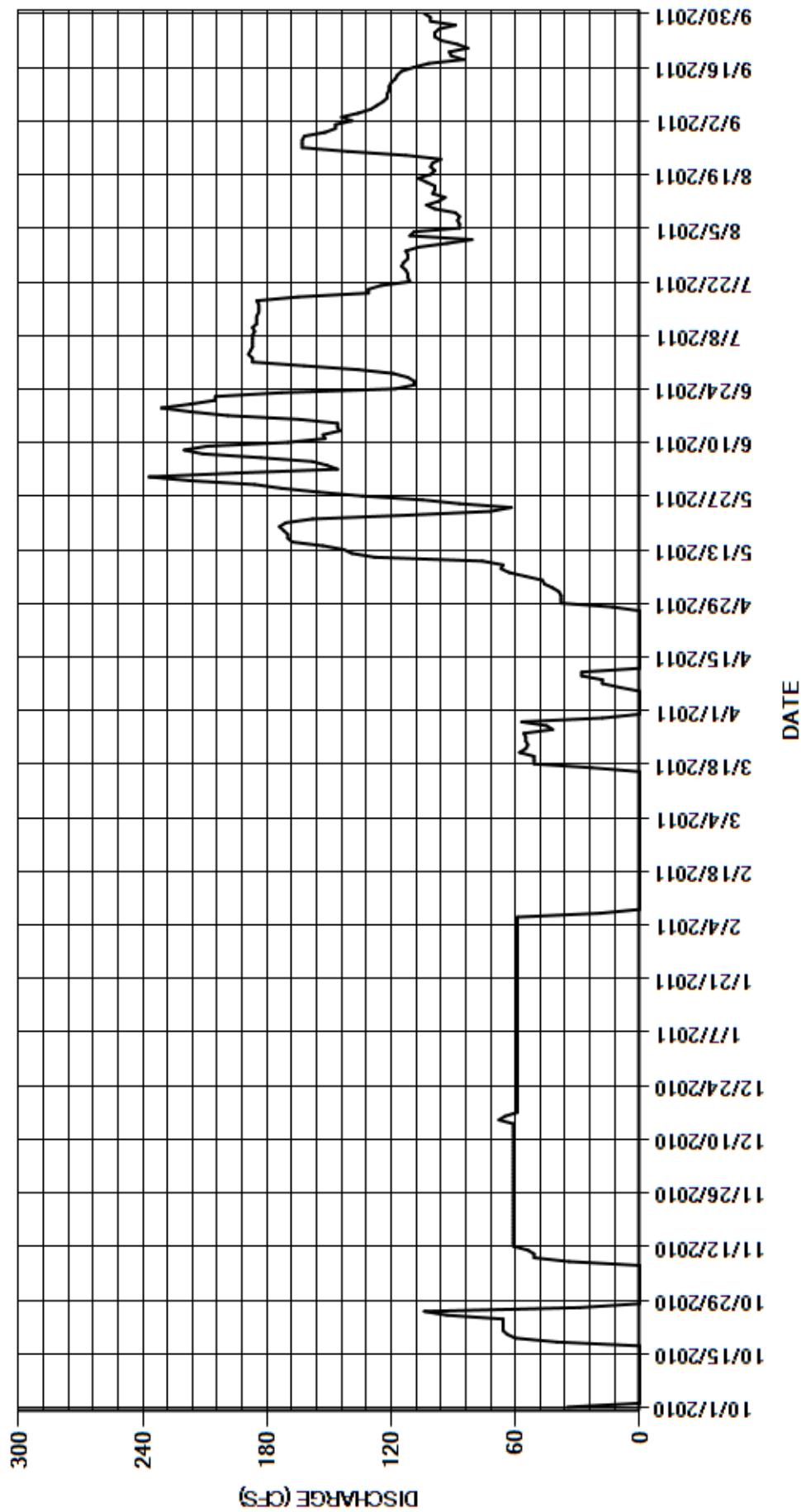
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	35	0.00	61	59	59	0.00	0.00	38	237	187	93	147
2	0.00	0.00	61	59	59	0.00	0.00	39	195	187	81	139
3	0.00	0.00	61	59	59	0.00	0.00	42	146	189	111	144
4	0.00	0.00	61	59	59	0.00	0.00	46	151	188	109	136
5	0.00	0.00	61	59	59	0.00	0.00	47	158	187	87	130
6	0.00	0.00	61	59	59	0.00	0.00	55	183	187	87	127
7	0.00	0.00	61	59	19	0.00	9.6	63	211	187	88	124
8	0.00	34	61	59	0.00	0.00	18	67	220	187	87	122
9	0.00	51	61	59	0.00	0.00	18	66	209	186	89	122
10	0.00	51	61	59	0.00	0.00	28	76	170	187	99	121
11	0.00	54	61	59	0.00	0.00	28	128	152	185	103	121
12	0.00	61	61	59	0.00	0.00	0.00	139	153	185	97	120
13	0.00	61	61	59	0.00	0.00	0.00	143	145	185	94	118
14	0.00	61	61	59	0.00	0.00	0.00	153	146	184	100	117
15	0.00	61	68	59	0.00	0.00	0.00	168	146	184	99	115
16	0.00	61	65	59	0.00	0.00	0.00	170	164	184	99	109
17	0.00	61	59	59	0.00	23	0.00	170	199	185	103	102
18	40	61	59	59	0.00	51	0.00	172	217	165	107	85
19	60	61	59	59	0.00	51	0.00	174	231	131	101	91
20	64	61	59	59	0.00	51	0.00	171	217	131	99	92
21	66	61	59	59	0.00	58	0.00	158	205	125	101	83
22	66	61	59	59	0.00	55	0.00	112	205	111	100	88
23	66	61	59	59	0.00	54	0.00	72	173	112	96	96
24	66	61	59	59	0.00	55	0.00	62	118	112	113	99
25	93	61	59	59	0.00	55	0.00	87	109	113	141	99
26	104	61	59	59	0.00	56	0.00	105	109	115	163	97
27	29	61	59	59	0.00	42	0.00	134	112	114	163	89
28	0.00	61	59	59	0.00	45	13	155	119	112	163	101
29	0.00	61	59	59	---	57	38	173	136	112	162	e101
30	0.00	61	59	59	---	18	38	186	162	113	152	104
31	0.00	---	59	59	---	0.00	---	217	---	107	147	---
TOTAL	689.00	1349.00	1872	1829	373.00	671.00	190.60	3588	5098	4837	3434	3339
MEAN	22.2	45.0	60.4	59.0	13.3	21.6	6.35	116	170	156	111	111
AC-FT	1370	2680	3710	3630	740	1330	378	7120	10110	9590	6810	6620
MAX	104	61	68	59	59	58	38	217	237	189	163	147
MIN	0.00	0.00	59	59	0.00	0.00	0.00	38	109	107	81	83
CAL YR	2010	TOTAL	25955.60	MEAN	71.1	MAX	368	MIN	0.00	AC-FT	51480	
WTR YR	2011	TOTAL	27269.60	MEAN	74.7	MAX	237	MIN	0.00	AC-FT	54090	

MAX DISCH: 244 CFS AT 10:45 ON MAY 31,2011 GH 2.74 FT SHIFT 0 FT

MAX GH: 2.74 FT AT 10:45 ON MAY 31,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LONE PINE CANAL BELOW GREAT CUT DIKE NEAR DOLORES
WY2011 HYDROGRAPH



DOLORES RIVER BASIN
DOLORES RIVER BELOW MCPHEE RESERVOIR
Water Year 2011

Location.--	Lat. 37°34'33", Long. 108°34'33", in SE 1/4 SE 1/4 sec. 2, T.38 N., R.16 W., NMPM, Montezuma County, Hydrologic Unit 14030002.
Drainage Area and Period of Record.--	819 mi ² . Published by the USGS prior to the construction of McPhee Reservoir Oct. 1, 1938 to Sep. 30, 1952. Provisional graphic and electronic data Aug. 1985 to Sept. 1990. Published streamflow record Oct. 1990 to present.
Equipment.--	Graphic water stage-recorder and a Sutron Satlink 2 HDR DCP with a shaft encoder on separate floats in a 60"x 60" cast concrete shelter and well. Primary reference is an electric drop tape inside the gage house. Secondary reference is the outside staff gage (0.00 to 4.50 ft) in the Parshall flume. The gage house is equipped with AC power. Control is a 15-foot concrete Parshall flume with flat wing walls that extend the width of the channel and act as the 2nd stage control.
Hydrologic Conditions.--	Large rocks and cobble line the channel above and below the 15-ft concrete Parshall flume. Silt deposits typically do not occur at this gage since the gage is directly below McPhee Reservoir. Heavy moss growth on the control and in the channel above the control affects the stage-discharge relationship during the summer months. Below a gage height of 3.00 ft the rating follows a standard 15-ft Parshall flume rating. As moss grows in the flume shifts tend to be more negative.
Gage-Height Record.--	The primary record is 15-minute shaft encoder data downloaded from satellite telemetry with DCP and chart record used for backup purposes. The gage was visited on 22 separate occasions this water year to verify the instruments remained calibrated to the primary reference. The shaft encoder was adjusted one time this water year (Dec. 3, 2010) with a -0.01 ft shaft encoder correction. Record from satellite telemetry is complete and reliable.
Datum Corrections.--	Levels were not run this water year. Levels were last run on Sep. 29, 2010 using BM No. 1 as base. The ET index was found to be reading -0.002 feet low. No corrections were made since the ET index was within the allowable error tolerances. Levels were also run to the three other reference marks (RM#2, RM#3 and RM#4). RM#2 was found to be reading correct (0.000 feet). RM#3 was found to be reading correct (0.000 feet) and RM#5 was found to be reading -0.003 feet low. No changes were made to the reference marks.
Rating.--	The control is a 15 foot Parshall Flume with flat wing walls extending 50 ft in both directions. Rating DOLBMCCO04A, dated Nov. 9, 2004, was used the entire water year. Below 3.00 ft the rating follows the general form of a standard Parshall flume. It is fairly well defined from 13 cfs to 5,580 cfs. Twelve measurements, Nos. 217 - 228, were completed this year ranging in discharge from 30.3 cfs to 1,210 cfs. They cover the range-in-stage experienced except for the lower average daily flow on Nov. 2, 3, 2010 and the higher average daily flows of Jun. 3-6, 12-14, 2011. The peak instantaneous flow of 1,480 cfs occurred at 0230 on June 4, 2011 at a gage height of 4.94 ft with a shift of 0.00 ft. It exceeded the stage of measurement No. 224, made June 2, 2011 by 0.29 feet in stage.
Discharge.--	Shifting control method was used during the entire water year. The control is very stable with little to no silt deposited at the entrance of the Parshall flume. Moss on the flume affects the shift which varies depending on the stage. Shifts were distributed by time and applied as defined by measurements and removing moss from the control. A +0.01 ft shift was maintained from the previous water year until the large change in stage at 0830 on November 1, 2010. Moss growth during the winter remains relatively stable as indicated by the shift of measurement Nos. 218, 219 and 220. The -0.06 ft shift was distributed until the large change in stage occurred on March 16, 2011. Shifts were distributed by time from -0.06 ft. to -0.04 ft across the change in stage from 0700 March 16, 2011 until 0845 March 16, 2011. The -0.04 ft. shift (as defined by measurement Nos. 221 and 222) were maintained until the beginning of runoff release that began on May 10, 2011. It was assumed that moss was scoured from the flume over a 3 hour period resulting in a shift distribution by time from -0.04 ft. at 0815 on May 10, 2011 to 0.00 ft. at 1115 on May 10, 2011. The 0.00 ft. shift (as defined by measurement Nos. 223, 224, 225, 226 and 227) was maintained until moss was removed from the control at 1300 on July 21, 2011 resulting in a -0.02 ft. shift adjustment. The -0.02 ft. shift was maintained until the large change in stage at 0915 on August 16, 2011. Shifts were distributed by time from -0.02 ft. at 0930 on August 16, 2011 to -0.09 ft. at 1030 on August 16, 2011 as defined by measurement No. 228. The -0.09 ft. shift was maintained until the large release began at 0145 on September 30, 2011. It was assumed that moss was scoured from the flume over a 3 hour period resulting in a shift distribution by time from -0.09 ft. at 0145 on September 30, 2011 to -0.06 ft. at 04:5 on September 30, 2011. The -0.06 ft. shift as defined by measurement No. 229 was maintained to the end of the water year. Measurements show shifts varying from -0.09 ft to +0.04 ft. All shifts were given full weight except for measurement Nos. 217, 219-227, which were discounted from -4% to 5% to smooth the shift distribution. Moss was removed from the concrete Parshall flume on July 21, 2011 and resulted in a gage height increase of 0.02 ft. The removal of the moss is represented in the shift.
Special Computations.--	Moss was removed from the concrete Parshall flume on July 21, 2011 (measurement No. 227) and resulted in a gage height increase of 0.02 ft. An increase in gage height is typically not the norm. It is assumed removing the moss increased the Manning's friction factor. The removal of the moss is represented in the shift.
Remarks.--	Record is good. Station maintained by Doug Pickering and Brian Boughton. Record developed by Brian Boughton.
Recommendations.--	Currently no recommendations have been made this water year.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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DOLORES RIVER BELOW MCPHEE RESERVOIR

RATING TABLE-- DOLBMCCO04A USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

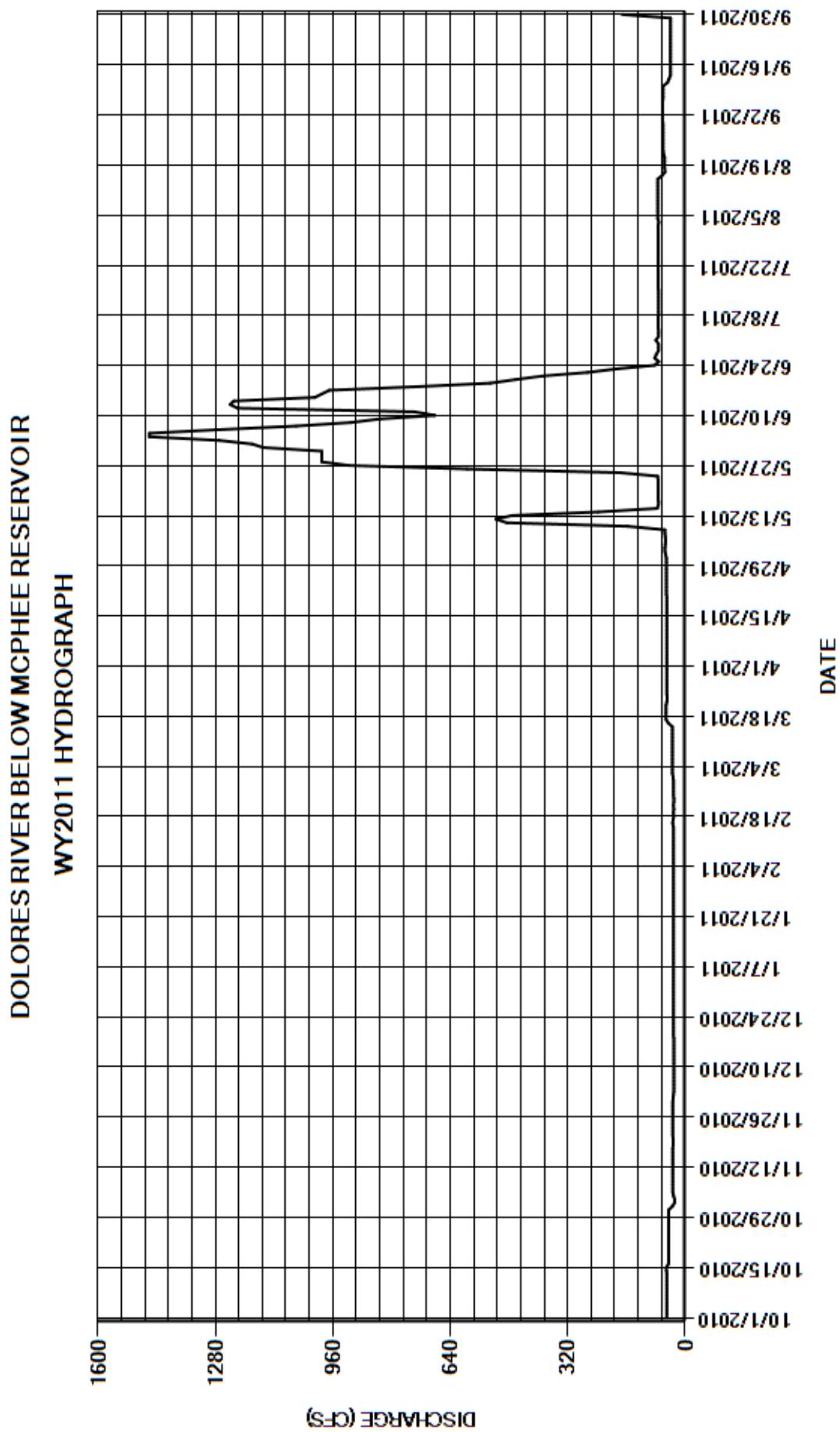
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	50	35	33	32	32	33	50	51	1150	80	74	61
2	50	29	32	32	32	35	50	53	1180	73	74	61
3	50	29	31	32	32	35	50	55	1270	73	72	61
4	50	32	31	32	32	35	50	55	1460	73	75	61
5	50	34	31	32	32	35	50	54	1460	74	75	61
6	50	34	31	32	32	35	50	53	1270	74	75	61
7	50	34	31	32	32	35	50	54	1060	74	75	60
8	50	34	31	32	32	35	50	55	911	73	75	60
9	50	34	31	32	32	35	50	55	831	73	75	60
10	50	34	31	32	32	35	50	157	682	73	75	60
11	50	34	31	32	32	35	50	486	738	73	75	48
12	50	34	31	32	32	35	50	516	1220	73	75	44
13	50	34	31	32	32	35	50	472	1240	73	75	40
14	51	34	31	32	32	35	50	237	1230	73	75	40
15	51	34	31	32	32	35	50	76	1010	73	75	40
16	45	34	31	32	34	46	50	73	990	74	63	40
17	45	34	31	32	33	52	50	73	970	74	55	40
18	45	33	31	32	31	52	50	74	731	74	56	40
19	45	33	32	32	32	52	50	74	531	74	56	40
20	45	33	32	32	31	52	50	74	462	74	56	40
21	45	34	32	32	32	52	51	74	388	74	56	40
22	45	34	32	32	31	50	51	74	266	74	59	40
23	45	34	32	32	31	49	51	74	185	74	60	40
24	45	34	32	32	32	50	51	75	83	74	60	40
25	45	34	32	32	32	50	51	179	72	74	60	40
26	45	34	32	32	32	50	51	594	83	74	60	40
27	45	34	32	32	32	50	51	916	79	74	60	40
28	45	34	32	32	32	50	51	990	73	74	60	40
29	45	34	32	32	---	50	51	990	73	74	60	40
30	45	34	32	32	---	50	51	990	73	74	60	172
31	45	---	32	32	---	50	---	990	---	74	61	---
TOTAL	1472	1006	977	992	895	1328	1510	8743	21771	2289	2062	1550
MEAN	47.5	33.5	31.5	32.0	32.0	42.8	50.3	282	726	73.8	66.5	51.7
AC-FT	2920	2000	1940	1970	1780	2630	3000	17340	43180	4540	4090	3070
MAX	51	35	33	32	34	52	51	990	1460	80	75	172
MIN	45	29	31	32	31	33	50	51	72	73	55	40
CAL YR	2010	TOTAL	29974	MEAN	82.1	MAX	1270	MIN	29	AC-FT	59450	
WTR YR	2011	TOTAL	44595	MEAN	122	MAX	1460	MIN	29	AC-FT	88450	

MAX DISCH: 1480 CFS AT 02:30 ON JUN 04,2011 GH 4.94 FT SHIFT 0 FT

MAX GH: 4.94 FT AT 02:30 ON JUN 04,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.



SAN JUAN RIVER BASIN
BLANCO DIVERSION NEAR PAGOSA SPRINGS
Water Year 2011

Location.--	Lat. 37°12'13", Long. 106°48'35", in NW 1/4 NE 1/4 sec. 11, T.34 N., R.1 E., NMPM, Archuleta County.
Drainage Area and Period of Record.--	N/A
Equipment.--	Graphic water stage-recorder and Sutron Satlink 2 HDR satellite monitoring DCP with stage-discharge recorder (SDR). The SDR and graphic recorder are on separate floats in a concrete shelter and well. The primary reference is an electric drop tape at the edge of the instrument shelf. No outside staff gage. The control is a 12-ft concrete Parshall flume set in an underground concrete box culvert. No changes this water year.
Hydrologic Conditions.--	This diversion is the beginning of the Azotea Tunnel. This portion of the tunnel runs from the Blanco Diversion to the Little Oso Diversion; the first leg in the trans-mountain diversion of the San Juan / Chama project. Cobble, gravel, and silt are deposited in the box culvert above the Parshall flume. The hydraulic conditions cannot be directly observed since the structure is located underground.
Gage-Height Record.--	The primary record is 15-minute SDR data downloaded from satellite telemetry with chart record and DCP data used for backup purposes. The gage was visited on seventeen separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The SDR was adjusted four times this water year: -0.03 ft on May 9 2011, +0.01 ft on Jul 27 2011, -0.01 ft on Aug 24 2011, and -0.01 ft on Sep 30 2011. The gage is visited almost daily (during normal business hours) by the USBR/Chama personnel during the diversion season. USBR personnel will adjust the graphic water stage-recorder but do not make adjustments to the SDR. The record is complete and reliable.
Datum Corrections.--	Levels were run in WY 2011 on the surface. The reference point and diversion house floor were surveyed in reference to a brass cap located outside the diversion house.
Rating.--	The control is a 12-foot Parshall flume. The Parshall flume is located underground and approximately 50 to 80 ft downstream of the radial gates. The only access point is located at the radial gates. One channel at all stages. Rating No. 1 was used the entire water year. Rating No. 1 is a standard twelve foot Parshall flume rating above a gage height of 0.06-ft. Flows below a gage height of 0.06-ft are assumed to be negligible and ignored. No discharge measurements have ever been made at the gage due to safety concerns. The peak instantaneous flow of 558 cfs occurred at 2100 July 11, 2011 at a gage height of 4.71 ft with a shift of 0.00 ft.
Discharge.--	No discharge measurements are made at this gage since the control structure is located underground. The standard 12-ft Parshall flume rating was applied directly to the gage height record to calculate the discharge.
Special Computations.--	No special computations were necessary this water year.
Remarks.--	The record is good. Station maintained and record developed by Brian Leavesley.
Recommendations.--	Try for WY2012 to obtain levels on the control structure in the tunnel.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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BLANCO DIVERSION NEAR PAGOSA SPRINGS

RATING TABLE-- BLADIVCO01 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

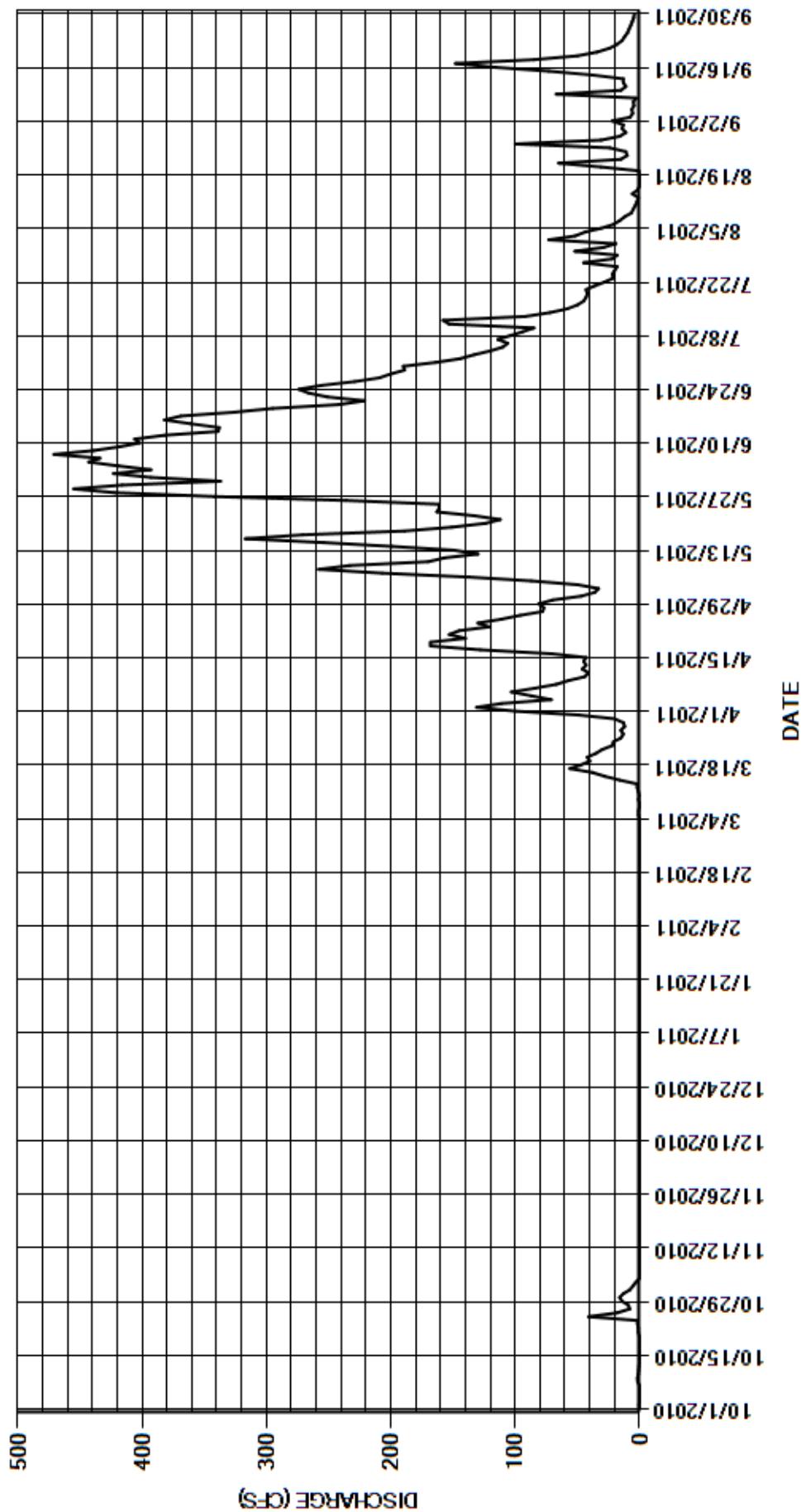
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.12	7.8	0.00	0.00	0.00	0.00	100	47	393	164	19	13
2	0.27	5.3	0.00	0.00	0.00	0.00	131	36	423	144	73	22
3	0.00	2.9	0.00	0.00	0.00	0.00	111	33	393	133	52	7.5
4	0.00	0.00	0.00	0.00	0.00	0.00	71	50	419	120	44	5.5
5	0.00	0.00	0.00	0.00	0.00	0.75	87	87	443	110	31	6.2
6	0.00	0.00	0.00	0.00	0.00	0.74	103	137	434	106	21	4.5
7	0.00	0.00	0.00	0.00	0.00	0.00	84	207	471	114	16	4.9
8	1.5	0.00	0.00	0.00	0.00	0.00	67	258	439	104	12	2.7
9	1.7	0.00	0.00	0.00	0.00	0.73	57	233	418	94	6.6	67
10	0.97	0.00	0.00	0.00	0.00	0.22	44	170	402	85	5.0	15
11	0.64	0.00	0.00	0.00	0.00	0.97	41	157	406	153	3.3	11
12	0.36	0.00	0.00	0.00	0.00	1.8	46	130	382	158	2.0	13
13	0.00	0.00	0.00	0.00	0.00	1.8	43	149	339	92	1.0	13
14	0.00	0.00	0.00	0.00	0.00	16	45	199	338	72	5.8	38
15	0.00	0.00	0.00	0.00	0.00	28	43	254	361	58	1.6	73
16	0.00	0.00	0.00	0.00	0.00	38	71	317	382	50	0.00	116
17	0.00	0.00	0.00	0.00	0.00	56	128	271	369	45	0.00	148
18	0.00	0.00	0.00	0.00	0.00	47	168	189	326	43	0.00	85
19	0.00	0.00	0.00	0.00	0.00	40	168	151	295	42	0.00	50
20	0.21	0.00	0.00	0.00	0.00	42	140	124	242	43	0.62	34
21	0.97	0.00	0.00	0.00	0.00	35	153	112	221	36	31	24
22	1.0	0.00	0.00	0.00	0.00	30	145	133	251	28	65	18
23	1.6	0.00	0.00	0.00	0.00	22	121	163	266	21	15	14
24	1.6	0.00	0.00	0.00	0.00	21	130	161	274	22	10	12
25	41	0.00	0.00	0.00	0.00	15	111	161	256	20	11	9.7
26	18	0.00	0.00	0.00	0.00	13	96	236	229	18	24	8.4
27	7.9	0.00	0.00	0.00	0.00	15	78	342	209	45	100	7.0
28	9.0	0.00	0.00	0.00	0.00	12	77	422	200	22	31	5.8
29	14	0.00	0.00	0.00	---	13	81	455	189	18	16	4.6
30	16	0.00	0.00	0.00	---	20	70	416	190	52	11	4.2
31	13	---	0.00	0.00	---	49	---	337	---	29	14	---
TOTAL	129.84	16.00	0.00	0.00	0.00	519.01	2810	6137	9960	2241	621.92	837.0
MEAN	4.19	0.53	0.000	0.000	0.000	16.7	93.7	198	332	72.3	20.1	27.9
AC-FT	258	32	0	0	0	1030	5570	12170	19760	4450	1230	1660
MAX	41	7.8	0.00	0.00	0.00	56	168	455	471	164	100	148
MIN	0.00	0.00	0.00	0.00	0.00	0.00	41	33	189	18	0.00	2.7
CAL YR	2010	TOTAL	20705.49	MEAN	56.7	MAX	496	MIN	0.00	AC-FT	41070	
WTR YR	2011	TOTAL	23271.77	MEAN	63.8	MAX	471	MIN	0.00	AC-FT	46160	

MAX DISCH: 558 CFS AT 21:00 ON JUL 11,2011 GH 4.71 FT SHIFT 0 FT

MAX GH: 4.71 FT AT 21:00 ON JUL 11,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

BLANCO DIVERSION NEAR PAGOSA SPRINGS
WY2011 HYDROGRAPH



SAN JUAN RIVER BASIN
09343300 RIO BLANCO BELOW BLANCO DIVERSION DAM NEAR PAGOSA
Water Year 2011

Location.--	Lat. 37°12'13", Long. 106°48'42", in NE¼, NW¼ sec. 11, T.34 N., R.1E., NMPM, Archuleta County, Hydrologic Unit 14080101, on left bank 250 ft downstream from Blanco Diversion Dam, 1.1 mi downstream from Leche Creek, and 12 mi southeast of Pagosa Springs.
Drainage Area and Period of Record.--	69.1 mi ² . March 1971 to current year.
Equipment.--	Graphic water stage-recorder and Sutron Satlink 2 HDR satellite monitoring DCP and a Sutron stage discharge recorder (SDR). The SDR and graphic recorder are on separate floats in a 48-inch by 48-inch concrete shelter and well. The primary reference is an electric drop tape at the edge of the instrument shelf. No outside staff gage. The control is a 4-ft steel Parshall flume set in a concrete structure that acts as a weir at high flows. No changes this water year.
Hydrologic Conditions.--	Cobble, gravel, and silt are deposited in the stilling pool above the control. Once a year, or at least every other year, the USBR removes the deposits above the control section. Approximately 250 feet above the control is a USBR diversion dam for the San Juan/Chama Project.
Gage-Height Record.--	The primary record is 15-minute SDR data downloaded from satellite telemetry with chart record and DCP data used for backup purposes. The gage was visited on 19 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted on 1 occasion this water year. An adjustment of +0.01 ft was made on Aug. 24, 2011. The gage is visited almost daily (during normal business hours) by the USBR-Chama personnel. USBR personnel will adjust the graphic water stage-recorder but do not make adjustments to the SDR. During the months of January and February, the gage height record showed numerous spikes. The spiking occurred typically on a regular interval. The spikes could be due to ice jamming in the gate of the diversion above, however there is no corresponding dip in the gage height chart record. Therefore, it was assumed that the spiking was caused by ice lodging directly in the flume and causing a rise in gage height not relating to an increase in discharge. The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice on the control: Jan. 1-5, 7-18, 25-26, 28-31; Feb. 1, 3-7, 10-16, 24, 2011.
Datum Corrections.--	Levels were run on October 14, 2010. Levels were run to the inside gage (ET index) using RM#1 as the base. The survey did not close within the allowable error. Levels will need to be run again in water year 2012. No corrections were made to the electric tape index and electric tape length.
Rating.--	The control is a four-foot Parshall flume installed in December 1979 to replace a v-notch weir. At an elevation of 3.00 feet, horizontal concrete wing walls extend in both directions for a total of 76 feet. There is one channel at all stages. Rating No. 6, dated Feb. 1, 2001, continued to be used this year. Rating No. 6 is based on the general shape of a four foot Parshall flume theoretical rating, and is the same as Rating No. 5, dated Dec. 26, 1985, above 3.00 feet. It is fairly well defined from 4.0 to 211 cfs. Seventeen measurements (Nos. 805 – 821) were made during this water year ranging in discharge from 16.5 to 41.0 cfs. They cover the range in stage experienced except for the lower average daily flows of Oct. 15-20, Nov. 18, 22-23, 25-26, 30, Dec. 1, 30-31, 2010; Jan. 1-6, 11, 24-25, 27, Feb. 3, 6, 9-12, 28, 2011, and the higher average daily flows of May 1-3, 6-8, 10, 27-30, Jun. 5-7, 2011. The peak instantaneous flow of 432 cfs occurred at 2245 on Jun. 5, 2011 at a gage height of 3.86 ft with a shift of 0.00 ft. It exceeded the stage of measurement No. 812, made May 9, 2011 by 2.09 feet in stage.
Discharge.--	Shifting section control method was used for all periods of good record. Shifting is mainly caused by erosion and deposition of small to medium gravels in the approach section of the flume and by the accumulation of trash and debris on the wing walls at flows above gage height of 2.70 ft. The approach sections and the wing walls are periodically cleaned by the USBR or State of Colorado employees and are noted on the chart. Shifts were applied as defined by measurements, flow events, and cleaning of the channel above the flume and were distributed by time for the entire period of record. Measurements showed unadjusted shifts from -0.02 ft. to +0.08 ft. All were given full weight and applied directly except for measurement Nos. 806, 810, 813, and 821 which were discounted from -4% and +2% to smooth shift distribution. Measurement no. 808 on Feb. 7, 2011 was made during ice affected conditions and the shift was not used in the distribution.
Special Computations.--	Discharge for periods of ice-affected gage height ('b'-days) were estimated using daily temperature data from the Navajo River at Banded Peak Ranch gaging station. Estimation was performed by looking at the base flow between affected periods and adjusting baseflow by observed trends in discharge-temperature relationship on good record days adjacent to the estimated period. Graphical data was a secondary source for estimation.
Remarks.--	The record is good, except for the period when ice on the control affected the stage discharge relationship, which is estimated and should be considered poor. Also, flows above 211 cfs should be considered fair record. The peak instantaneous flow should be considered fair. Station maintained and record developed by Brian Leavesley.
Recommendations.--	A crest gage should be installed at the gage to maintain a peak gage height record. Levels should be rerun at the gage in water year 2012 until closure of the survey is made. GPS should be taken to the site to obtain refined LAT/LONG coordinates as there is discrepancy in the seconds of longitude between the station description and AQUAMAP GIS.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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09343300 RIO BLANCO BELOW BLANCO DIVERSION DAM NEAR PAGOSA

RATING TABLE.-- RIOBLACO06 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

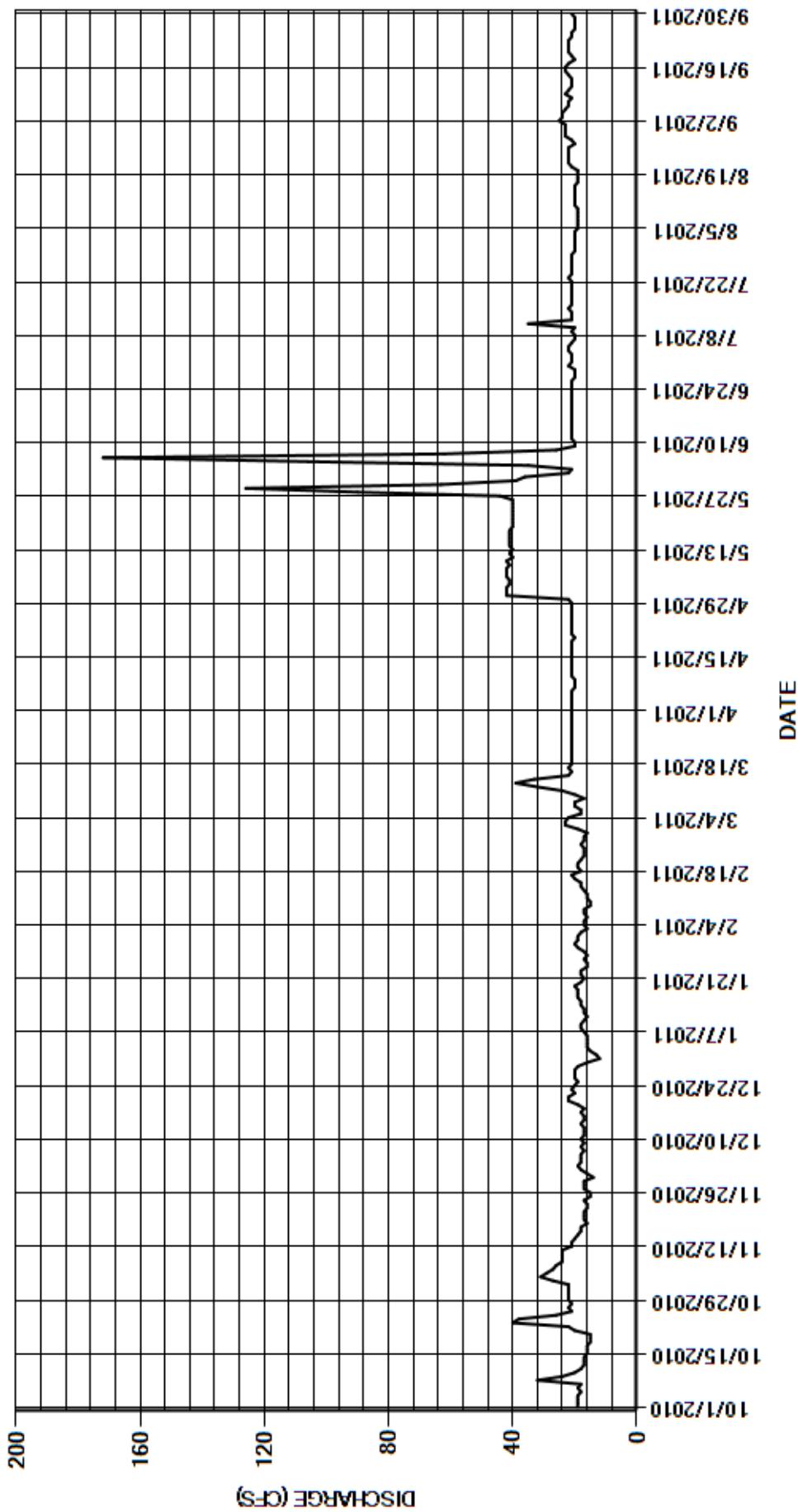
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	19	22	16	e13	e19	19	21	42	36	21	20	23
2	19	22	18	e15	18	23	21	42	22	21	20	25
3	19	27	19	e16	e16	23	21	42	21	21	20	24
4	19	31	18	e16	e17	22	21	41	35	22	20	24
5	18	29	18	e16	e17	18	21	41	106	22	19	23
6	19	27	18	16	e16	18	21	42	172	21	19	22
7	18	26	17	e17	e17	20	20	42	62	20	19	22
8	32	24	18	e18	17	20	20	42	26	20	19	21
9	24	24	17	e18	15	17	20	41	20	21	19	23
10	20	24	18	e17	e15	20	21	42	20	20	19	22
11	18	24	17	e16	e16	24	21	40	21	35	20	21
12	17	21	17	e17	e16	32	21	41	21	21	20	21
13	17	21	17	e17	e17	39	21	40	21	21	20	21
14	17	20	18	e18	e18	33	21	41	21	21	20	22
15	16	19	17	e18	e18	22	21	41	21	22	20	23
16	16	18	17	e19	e20	21	21	41	21	21	20	23
17	16	18	18	e19	21	22	21	41	21	21	19	22
18	15	16	17	e19	18	21	21	41	21	21	19	20
19	15	17	19	20	19	21	21	40	21	21	19	21
20	15	17	22	18	19	21	20	40	21	21	19	22
21	20	17	22	17	18	21	21	40	21	21	21	22
22	22	16	20	18	17	21	21	40	21	21	22	22
23	40	16	21	18	17	21	21	40	21	22	22	22
24	38	17	20	16	e17	21	21	40	21	21	22	21
25	26	15	19	e16	18	21	21	40	21	21	22	21
26	21	15	20	e17	17	21	21	40	21	21	22	20
27	22	17	20	16	17	21	21	44	20	21	20	20
28	21	17	20	e17	16	21	21	90	20	21	21	20
29	22	17	19	e19	---	21	21	126	20	21	23	20
30	22	14	16	e20	---	21	22	63	22	20	23	21
31	22	---	12	e19	---	21	---	39	---	20	23	---
TOTAL	645	608	565	536	486	687	627	1425	938	664	631	654
MEAN	20.8	20.3	18.2	17.3	17.4	22.2	20.9	46.0	31.3	21.4	20.4	21.8
AC-FT	1280	1210	1120	1060	964	1360	1240	2830	1860	1320	1250	1300
MAX	40	31	22	20	21	39	22	126	172	35	23	25
MIN	15	14	12	13	15	17	20	39	20	20	19	20
CAL YR	2010	TOTAL	8507	MEAN	23.3	MAX	218	MIN	12	AC-FT	16870	
WTR YR	2011	TOTAL	8466	MEAN	23.2	MAX	172	MIN	12	AC-FT	16790	

MAX DISCH: 432 CFS AT 22:45 ON JUN 05,2011 GH 3.86 FT SHIFT 0 FT

MAX GH: 3.86 FT AT 22:45 ON JUN 05,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09343300 RIO BLANCO BELOW BLANCO DIVERSION DAM NEAR PAGOSA
WY2011 HYDROGRAPH



SAN JUAN RIVER BASIN
RIO BLANCO AT THE MOUTH NEAR TRUJILLO
Water Year 2011

Location.--	Lat. 37°07'40", Long. 107°02'03", in SW 1/4 SE 1/4 sec. 2, T.33 N., R.2 W., NMPM, Archuleta County, Hydrologic Unit 14080101, on the right bank 0.75 miles upstream of San Juan River and 5.7 miles downstream of Rito Blanco.
Drainage Area and Period of Record.--	Drainage area = 170 mi ² . Published streamflow record Colorado Division of Water Resources November, 1970 to present.
Equipment.--	Graphic water stage-recorder and a Sutron Satlink 2 DCP with a shaft encoder on a separate float in a 48-inch corrugated well and a 96-inch X 60-inch wooden shelter. The primary reference gage is a steel drop tape referenced to an adjustable reference point (RP). A Sutron Constant Flow Bubbler (CFB) provides secondary gage height record independent of the stilling well. No changes this WY.
Hydrologic Conditions.--	Large cobbles and boulders line the channel above and below the gage. A large boulder weir was installed below the gage. The United States Bureau of Reclamation diverts a majority of the water upstream of the gage for the San Juan Chama Project. The gage is located approximately one mile above the confluence with the San Juan River.
Gage-Height Record.--	The primary record is 15-minute shaft encoder data downloaded from satellite telemetry with chart and bubbler record for backup purposes. Continuous record kept from Oct. 1, 2010 to Sep. 30, 2011. The gage was visited on 14 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted on 2 separate occasions. The SE adjustments of the year occurred on Mar. 17, 2011 (+0.02 ft.) and Apr. 13, 2011 (-0.01 ft.). One flush correction was made this water year. The flush correction occurred on Jun. 18, 2011 (-0.10 ft.). The flush corrections at this gage tend to be negative because groundwater infiltrates the stilling well. The flush correction was related to the ramp-down from the peak in the stream flow record prior to the correction. The CFB provides a very good match to the SE record; therefore, the flush correction was not applied as the CFB data was substituted for the period when intakes to the well were plugged. The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice on the control: Nov 13, 24-30; Dec. 1-8, 26-31, 2010; Jan. 1-31; Feb 1-28; Mar. 1-11, 2011. It also appears that the stilling well isolated around gage height 1.07 ft. There were 3 days in November when the stilling well isolated. Those were Nov. 14, 16, 23, 2010.
Datum Corrections.--	Levels were not run this water year.
Rating.--	The low flow control is a cobble riffle 15-ft below the gage. At medium and high flows a boulder weir located 30-ft. below the gage controls. Small gravels fill and scour with the change in stage causing shifts. Rating No. 5, in use for record purposes since Mar. 30, 2010 was used for the entire water year. Twelve measurements (Nos. 633-644) were made during the current water year ranging in discharge from 14.5 to 119 cfs. They cover the range in stage experienced except for the lower average daily flows of Oct. 17-20, Nov. 23, 2010; Aug. 9, 11, 13, 17-20, 28, 2011 and the higher average daily flows of May 9, 16-17, 28-30, Jun. 5-7, 2011. The instantaneous peak flow of 410 cfs occurred at 0045, May 29, 2011 at a gage height of 3.16 ft and a shift of -0.01 ft. It exceeded measurement No. 638 made May 9, 2011 by 1.00 ft in stage.
Discharge.--	Shifting control method was used during the entire water year. Shifts were distributed by time for the entire period of record. Shifting is mainly caused by erosion and deposition of small to medium gravels on the control section. Measurements show unadjusted shifts from -0.07 ft. to +0.03 ft. Shifts were applied directly and given full weight except for measurement Nos. 637, 638, 639 and 640 which were discounted -7% to +7% to smooth shift distribution. The shift from measurement no. 635 was not used as the stage was affected by ice on the control.
Special Computations.--	Discharge for periods of ice affected record and gage isolation was estimated on the basis of adjacent good record days, partial good record days, comparison with the discharge at Rio Blanco below the Blanco Diversion Dam (RIOBLACO) gage and air temperature records at the Navajo River at Banded Peak (NAVBNACO) gage. A hydrograph was used.
Remarks.--	Record fair, except for those periods of ice affect and stilling well isolation which are estimated and should be considered poor. Station maintained and record developed by Brian Leavesley.
Recommendations.--	Set a permanent benchmark and run levels in WY12. With this new rating, more measurements should be made in all ranges, but especially in the mid-range.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

RIO BLANCO AT THE MOUTH NEAR TRUJILLO

RATING TABLE.-- RIOMOUCO05 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

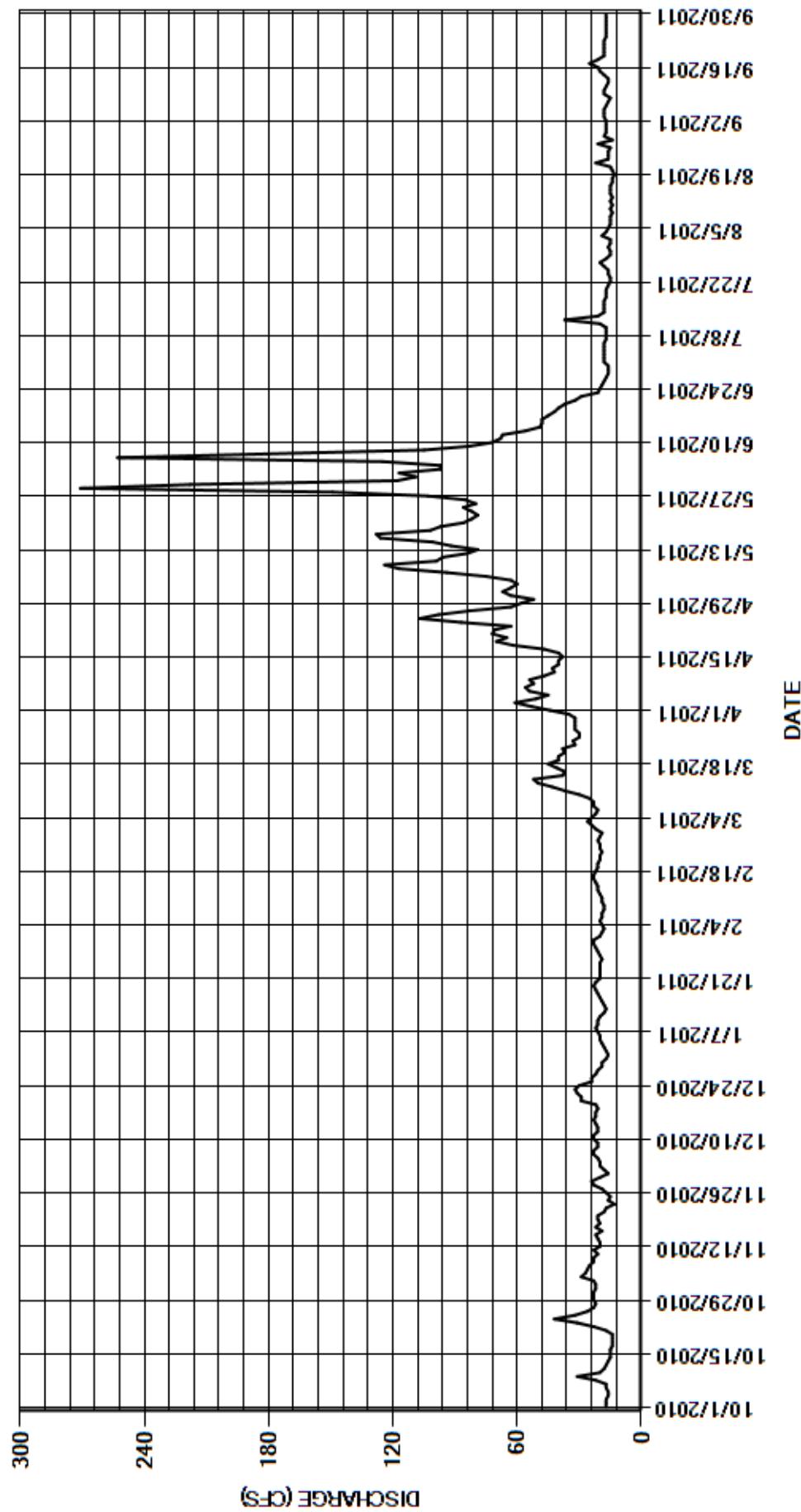
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	22	e16	e16	e20	e22	44	63	109	18	15	17
2	17	22	e18	e17	e19	e24	53	67	117	18	15	17
3	17	23	e20	e18	e18	e26	61	63	97	18	19	18
4	16	29	e20	e19	e19	e24	51	60	97	18	17	18
5	16	27	e21	e20	e20	e22	45	63	125	18	16	18
6	17	26	e23	e20	e19	e21	54	75	253	18	15	17
7	17	25	e23	e21	e19	e23	56	94	181	17	15	16
8	22	23	e21	e22	e18	e23	52	117	105	17	15	15
9	31	23	21	e21	e18	e25	54	124	83	17	14	18
10	20	21	23	e21	e19	e30	47	99	72	17	15	18
11	18	23	23	e20	e19	e37	42	96	68	20	14	17
12	17	20	21	e18	e20	43	43	84	67	37	15	16
13	16	e20	21	e17	e21	50	40	79	56	21	14	16
14	15	e21	22	e18	e21	52	40	92	49	18	15	18
15	15	22	23	e19	e22	38	38	101	48	18	15	20
16	15	e19	22	e20	e23	37	40	126	48	18	15	21
17	14	22	22	e21	e23	41	47	128	45	18	14	25
18	14	20	21	e22	e22	45	62	102	42	17	14	21
19	14	21	22	e23	e21	40	70	97	40	17	13	18
20	14	21	29	e22	e21	40	65	86	37	17	14	18
21	17	18	29	e20	e20	37	72	82	32	16	15	18
22	23	17	31	e20	e20	38	71	79	29	15	22	18
23	31	e13	32	e20	e19	32	63	82	21	15	16	18
24	42	e16	30	e20	e20	33	87	86	20	16	16	17
25	32	e15	24	e20	e20	30	107	80	19	16	16	17
26	26	e17	e24	e19	e21	30	98	85	18	18	15	17
27	23	e19	e22	e20	e20	32	83	103	17	20	21	17
28	22	e23	e21	e21	e19	32	63	149	16	17	14	17
29	23	e24	e19	e22	---	32	58	271	16	15	18	17
30	23	e20	e19	e23	---	32	52	218	16	15	17	17
31	23	---	e17	e23	---	35	---	118	---	16	17	---
TOTAL	627	632	700	623	561	1026	1758	3169	1943	556	486	535
MEAN	20.2	21.1	22.6	20.1	20.0	33.1	58.6	102	64.8	17.9	15.7	17.8
AC-FT	1240	1250	1390	1240	1110	2040	3490	6290	3850	1100	964	1060
MAX	42	29	32	23	23	52	107	271	253	37	22	25
MIN	14	13	16	16	18	21	38	60	16	15	13	15
CAL YR	2010	TOTAL	15822	MEAN	43.3	MAX	547	MIN	13	AC-FT	31380	
WTR YR	2011	TOTAL	12616	MEAN	34.6	MAX	271	MIN	13	AC-FT	25020	

MAX DISCH: 410 CFS AT 00:45 ON MAY 29,2011 GH 3.16 FT SHIFT -0.01 FT

MAX GH: 3.16 FT AT 00:45 ON MAY 29,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

RIO BLANCO AT THE MOUTH NEAR TRUJILLO
WY2011 HYDROGRAPH



SAN JUAN RIVER BASIN
09344000 NAVAJO RIVER AT BANDED PEAK RANCH NEAR CHROMO
Water Year 2011

Location.--	Lat. 37°05'07", Long. 106°41'20", in SE 1/4 NW 1/4 sec. 24, T.33 N., R.2 E., NMPM, Archuleta County, Hydrologic Unit 14080101, on right bank at downstream side of private bridge on Banded Peak Ranch, 0.5 mi downstream from Cutthroat Creek, 2.8 mi downstream from East Fork of the Navajo River, and 11.2 mi northeast of Chromo, Co.
Drainage Area and Period of Record.--	69.8 mi ² .
Equipment.--	Graphic water stage-recorder and shaft encoder connected to a Sutron Satlink 2 DCP in a 48-inch x 48-inch redwood shelter and well. The shaft encoder and graphic recorder are on separate floats. The floats are located inside a 14-inch PVC oil cylinder. The primary reference gage is an electric drop tape in the gage. A drop tape is a supplemental reference gage and is mainly used when the well is frozen. An air temperature sensor and Sutron AccuBubbler are used for supplemental purposes. On Sep 28, 2011, the AccuBubbler was replaced with a Sutron constant-flow bubbler (CFB). A tipping bucket precipitation gage was installed on Apr 22, 2011. No other changes this WY.
Hydrologic Conditions.--	The stream is composed of sand, gravel, and large cobble. In the spring, sustained high water scours sand and gravel from the streambed. In mid-Summer to late Fall and Winter, the sand and gravel are deposited in the channel at the gage. The control and channel are highly susceptible to fill and scour events.
Gage-Height Record.--	The primary record is 15-minute shaft encoder data downloaded from satellite telemetry with the DCP log, bubbler gage data, and chart record for backup purposes. The gage was visited on 19 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. Record is complete and reliable, except for the following periods: stage-discharge relationship affected by ice on Nov. 23, 25-27, 30; Dec. 1, 8, 30-31, 2010; Jan. 1-3, 5-8, 10-13, 15-16, 21-25, 27-30; Feb. 1-7, 9-13, 23, 28; Mar. 1, 5-6, 10, 23, 2011 ; stilling well intakes unable to be flushed out (plugged): Jun. 8-20, 2011. During spring runoff, there is considerable sediment load that fills the intakes to the stilling well. In years past (there was no effect of this kind in WY2011), at channel velocities above ~4.5 feet per second, there appeared to be drawdown in the stilling well caused by the velocity past the intakes after flushing. As the intakes to the well fill with sediment, it appears to buffer out the velocity effect and provide a smoother gage height record. Over the water year, 7 flush corrections were applied to the GH record. They occurred as a result of flushing the intakes on: Apr 5 and 22, May 2, Jun 20, Jul 5 and 19, and Sep 28 2011. Bubbler gage height record was substituted for the shaft encoder gage height record for the period of 1600 Dec 30 2010 to 1445 Feb 11 2011 due to the cold weather causing an ice disk to form under the oil in the float well. Bubbler data were also substituted for the periods of Sep 9-12 2011 and Sep 17-28 2011 as the bubbler tracked GH during rainfall events and flush corrections better and was not affected by flush correction after event. These bubbler data periods are considered reliable record. Missing or bad unit GH values were replaced with chart record on Oct 18 (one value), Jul 20 (one value), and Sept 28 (4 values) without loss of accuracy.
Datum Corrections.--	Levels were not run in WY2011. Levels were last run on July 23, 2009 using BM#6 as the base. No corrections were made as the elevation of the ET index was found to be within allowable error tolerances.
Rating.--	The control consists of a cobble riffle whose location varies during the year from 30 to 70 feet below the gage. Shifting occurs throughout the range-in-stage. Rating No. 23, dated Aug. 22, 1996, was continued in use this year. It is fairly well defined between 22 and 603 cfs. Sixteen measurements (Nos. 853-868) were made during the current water year ranging in discharge from 26.8 to 417 cfs. They cover the range in stage except for the higher daily flows of May 29; Jun. 6-7, 2011, and the lower daily flows on Dec. 30-31, 2010; Jan 1-7, 2011. The peak discharge of 584 cfs occurred at 0000 on June 7, 2011 at a gage height of 3.59 feet with a shift of -0.16 feet. It exceeded high measurement No. 862 by 0.23 ft in stage.
Discharge.--	Shifting control method was used during the entire water year. Shifting is caused mainly by erosion and deposition on the control section below the gage. Shifts were distributed by time proration with consideration given to changes in stage from Oct 1 2010 to Mar 17 2011, and from 0030 May 9 2011 to the end of the WY. Shifts were distributed by stage using variable stage shift relationship, NAVBANCOVS11A based on Msmts 857-860, from 1530 Mar 17 to 0015 May 9 2011. Measurements showed unadjusted shifts from -0.24 to -0.06 ft. All were given full weight and applied directly except for measurement Nos. 858, 863, 864, 866, and 868 which were discounted from -4 to +5 % to smooth the shift distribution.
Special Computations.--	Discharge for periods of ice effect was estimated on the basis of good record before and after ice effect, partial day of good records and the temperature record from the air temperature sensor at the gaging station. The bubbler equipment was used as a secondary reference and was deemed to be reliable for certain periods of record when plugging of the intakes and ice affected the gage height in the stilling well.
Remarks.--	Record is good, except for periods of ice effect and when the intakes to the stilling well were unable to be flushed, which are estimated and should be considered fair. Periods of bubbler data insertion into the record may be considered good. The instantaneous peak flow should be considered fair, as it occurred within 24 hours prior to a gage visit on June 8 2011 when the intakes could not be flushed . Station maintained and record developed by Brian Leavesley.
Recommendations.--	The shelter should be restrained to prevent deterioration. Levels should be run in WY2012.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09344000 NAVAJO RIVER AT BANDED PEAK RANCH NEAR CHROMO

RATING TABLE.-- NAVBANCO23 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

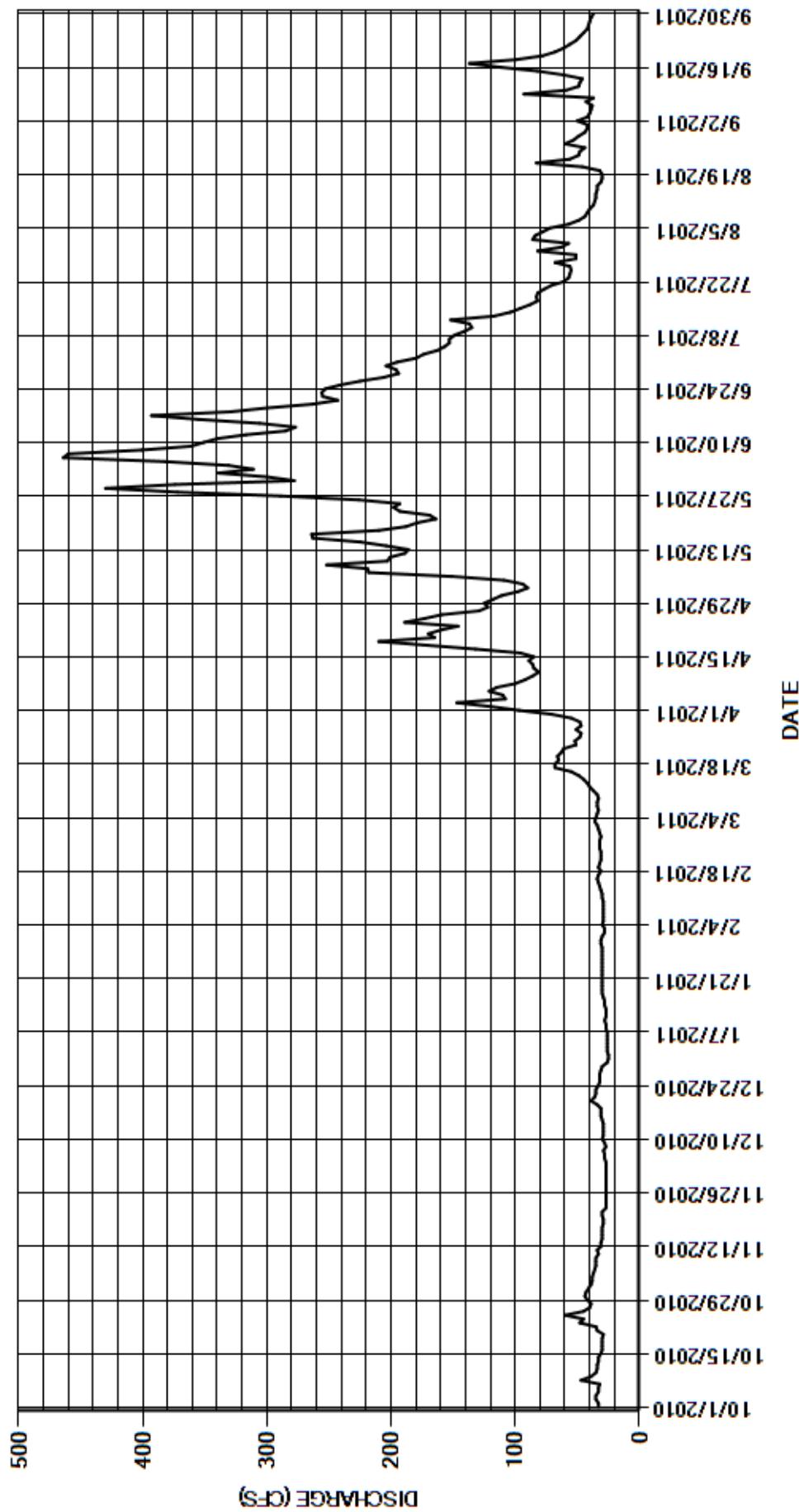
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	33	41	e27	e25	e30	e33	97	111	300	195	57	42
2	33	39	27	e26	e28	34	120	98	339	180	86	50
3	35	38	27	e26	e28	36	147	90	311	174	84	42
4	35	38	27	26	e30	35	108	94	331	163	78	40
5	33	37	28	e26	e29	e34	110	109	382	157	72	39
6	33	36	28	e26	e29	e33	121	151	464	153	57	38
7	32	35	29	e26	e29	34	115	218	460	153	49	43
8	47	35	e27	e27	29	34	100	219	401	149	44	37
9	39	35	28	27	e29	33	92	252	361	141	42	93
10	35	33	30	e28	e29	e34	86	203	351	135	40	59
11	34	34	29	e27	e30	37	81	201	340	137	37	49
12	34	31	29	e27	e30	40	85	189	317	152	36	48
13	33	31	29	e27	e31	42	86	186	285	117	35	46
14	33	30	29	28	32	45	89	204	277	104	35	61
15	31	30	30	e28	33	49	85	225	306	96	34	82
16	30	30	31	e29	34	55	96	263	355	88	34	112
17	30	30	31	30	33	68	132	264	393	82	31	137
18	30	29	31	30	31	68	171	210	329	83	30	99
19	30	29	34	30	33	65	210	188	300	82	30	78
20	29	30	39	30	32	66	165	179	263	77	32	68
21	34	30	36	e30	31	63	170	164	243	71	46	61
22	35	27	35	e30	31	61	160	169	255	61	83	56
23	48	e27	35	e30	e31	e51	146	193	256	57	56	51
24	45	27	33	e30	32	52	189	198	253	56	49	48
25	60	e27	32	e30	32	48	173	193	241	55	48	45
26	45	e27	32	30	32	47	159	226	225	56	44	42
27	40	e27	32	e30	31	51	129	289	206	68	60	41
28	39	27	31	e30	e32	47	122	372	194	51	53	40
29	42	27	30	e30	---	48	125	430	196	51	49	39
30	44	e27	e26	e31	---	55	118	374	204	82	44	37
31	43	---	e25	31	---	71	---	278	---	63	42	---
TOTAL	1144	944	937	881	861	1469	3787	6540	9138	3289	1517	1723
MEAN	36.9	31.5	30.2	28.4	30.8	47.4	126	211	305	106	48.9	57.4
AC-FT	2270	1870	1860	1750	1710	2910	7510	12970	18130	6520	3010	3420
MAX	60	41	39	31	34	71	210	430	464	195	86	137
MIN	29	27	25	25	28	33	81	90	194	51	30	37
CAL YR	2010	TOTAL	34306	MEAN	94.0	MAX	781	MIN	25	AC-FT	68050	
WTR YR	2011	TOTAL	32230	MEAN	88.3	MAX	464	MIN	25	AC-FT	63930	

MAX DISCH: 584 CFS AT 00:00 ON JUN 07,2011 GH 3.59 FT SHIFT -0.16 FT

MAX GH: 3.59 FT AT 00:00 ON JUN 07,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09344000 NAVAJO RIVER AT BANDED PEAK RANCH NEAR CHROMO
WY2011 HYDROGRAPH



SAN JUAN RIVER BASIN
OSO DIVERSION NEAR CHROMO, CO.

Water Year 2011

Location.--	Lat. 37°01'49", Long. 106°44'14", in NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 9, T.32 N., R.2 E., NMPM, Archuleta County, Hydrologic Unit 14080101, on the left bank 7 miles upstream of the confluence with the Little Navajo River.
Drainage Area and Period of Record.--	Drainage area above the diversion is 97.2 sq. mi. Diversion record Nov. 1, 1973 to present. Published streamflow record Oct. 1, 1990 to present.
Equipment.--	Sutron Satlink 2 DCP and a digital shaft encoder in a concrete control house used by the Bureau of Reclamation (Bureau) to house the telemetry for control of the Oso diversion structure. The Bureau utilizes a Stevens A-71 chart recorder with an attached signal converter to send data to their SCADA system. The primary reference gage is an electric drop tape inside the gage house. Control is a 15-foot concrete Parshall flume set into the diversion tunnel below ground. No changes this water year.
Hydrologic Conditions.--	The Oso diversion is part of the San Juan-Chama Project and is a transmountain diversion structure which creates an on-stream reservoir on the Navajo River above the diversion to collect runoff and settle out sediment. Water can be released downstream by means of a vertical Tainter gate or taken into the Azotea Tunnel which conveys water to the Rio Grande basin. Diversion amount is controlled by the capacity of the tunnel as water in the tunnel is also diverted from the Little Navajo River and Rio Blanco. The measurement flume is located within the diversion tunnel. It is typically a seasonal diversion where the Bureau attempts to capture and divert the maximum amount of spring runoff while adhering to minimum release limits set forth in the legislation for the San Juan-Chama Project and agreements between the Bureau and State of Colorado. Since the diversion primarily operates in the Spring and Summer, ice does not affect the control. Occasionally, the Tainter gates on the diversion tunnel will become stuck open from ice and diversion into the tunnel will take place.
Gage-Height Record.--	The primary record is 15-minute shaft encoder data downloaded from satellite telemetry with DCP downloads used for backup purposes. The record is complete and reliable. Upon inspection on March 4, the shaft encoder was reading -0.22 ft. The station was visited 20 times over the water year by DWR personnel to ensure that the shaft encoder remained calibrated to the primary reference. There were five adjustments made to the shaft encoder throughout the water year: +0.03 ft on Mar 16 2011 (+0.02 ft was applied in the record after review of GH's before and after), -0.02 ft on Apr 5, -0.01 ft on Jun 8, +0.01 ft on Jun 21, and +0.01 ft on Aug 5.
Datum Corrections.--	Levels were run at the control house on Feb 24 2011 to tie in the R.P. in the control house to a brass cap (BM#1) outside. The flume itself was not surveyed on this circuit. No corrections to the datum were made.
Rating.--	The control is a standard 15-ft. concrete Parshall flume. Rating No. 1 (OSODIVCO01) is a standard 15-ft. Parshall flume rating above a gage height of 0.05 ft, and was used the entire water year. The flows below a gage height of 0.05 ft. are assumed to be 0. This is caused by the intake to the stilling well being 0.05 ft. above the floor of the flume or the stilling well does not provide sufficient depth for float movement. No measurements were made this water year because the flume is located underground. The peak instantaneous flow of 527 cfs occurred at 0100 on June 6, 2011 at a gage height of 3.98 ft. with a shift of 0.00 ft.
Discharge.--	No measurement of this diversion has taken place. A 0.00 shift was applied for the entire year. The discharge record was computed by direct application of the rating to the gage height record.
Special Computations.--	No special computations were necessary.
Remarks.--	Record is rated as 'fair' for the entire period. A 'fair' rating was given due to the fact that levels have never been run in the tunnel to determine the actual elevation of the flume; also, measurements have never taken place due to the inaccessibility of the flume. Station maintained and record developed by Brian Leavesley.
Recommendations.--	Run levels in the tunnel on the flume/intake.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

OSO DIVERSION NEAR CHROMO, CO.

RATING TABLE-- OSODIVCO01 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

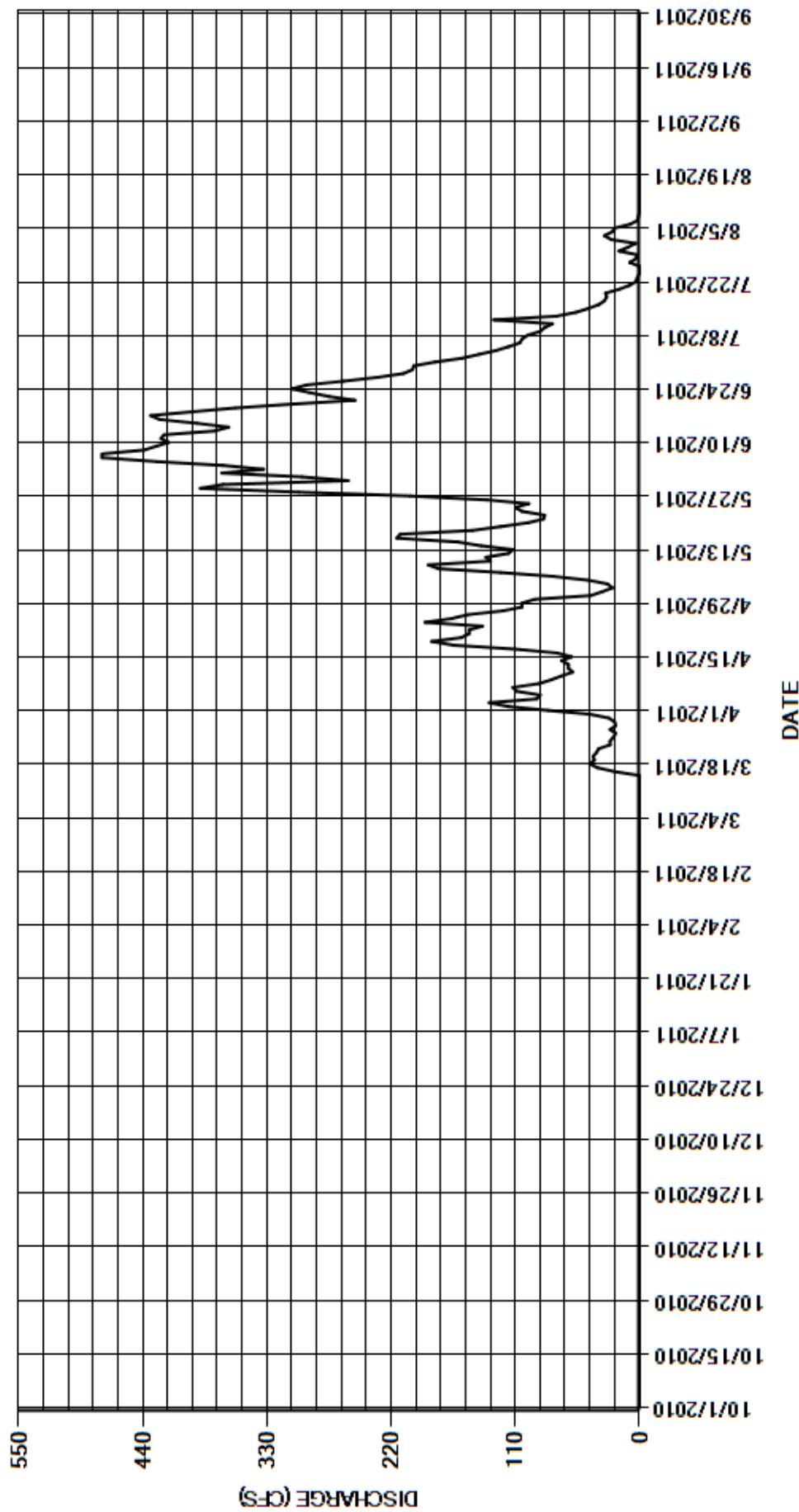
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	81	43	299	181	3.3	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	116	33	370	157	25	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	133	24	333	142	31	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	91	28	369	127	24	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	88	45	428	116	22	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	109	76	476	106	8.1	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	112	123	476	104	1.6	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	89	178	439	99	0.84	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	78	187	428	88	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	69	132	417	84	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	59	136	424	77	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	63	116	421	129	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	63	112	376	73	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	69	140	364	56	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.06	60	161	392	45	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	22	73	215	425	36	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	37	110	212	433	31	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	44	164	148	396	29	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	40	184	123	358	30	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	41	158	99	308	18	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	38	151	85	252	9.1	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	36	151	84	275	3.1	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	26	139	104	292	1.9	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	26	190	110	308	0.22	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	23	166	98	295	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	21	152	135	262	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	26	121	203	232	8.7	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	21	104	302	209	3.1	0.00	0.00
29	0.00	0.00	0.00	0.00	---	22	104	389	201	1.7	0.00	0.00
30	0.00	0.00	0.00	0.00	---	27	93	369	200	18	0.00	0.00
31	0.00	---	0.00	0.00	---	44	---	258	---	10	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	494.06	3340	4468	10458	1783.82	115.84	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	15.9	111	144	349	57.5	3.74	0.000
AC-FT	0	0	0	0	0	980	6620	8860	20740	3540	230	0
MAX	0.00	0.00	0.00	0.00	0.00	44	190	389	476	181	31	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	59	24	200	0.00	0.00	0.00
CAL YR	2010	TOTAL	21248.31	MEAN	58.2	MAX	538	MIN	0.00	AC-FT	42150	
WTR YR	2011	TOTAL	20659.72	MEAN	56.6	MAX	476	MIN	0.00	AC-FT	40980	

MAX DISCH: 527 CFS AT 01:00 ON JUN 06,2011 GH 3.98 FT SHIFT 0 FT

MAX GH: 3.98 FT AT 01:00 ON JUN 06,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

OSO DIVERSION NEAR CHROMO, CO.
WY2011 HYDROGRAPH



SAN JUAN RIVER BASIN
09344400 NAVAJO RIVER BELOW OSO DIVERSION DAM NEAR CHROMO
Water Year 2011

Location.--	Lat. 37°01'49", Long. 106°44'14", in NW 1/4 NE 1/4 sec. 9, T.32 N., R.2 E., NMMPM, Archuleta County, Hydrologic Unit 14080101, on left bank 600 ft downstream from Oso Diversion Dam, 5.8 mi east of Chromo, and 6.1 mi upstream from Little Navajo River.
Drainage Area and Period of Record.--	100.5 mi ² . March 1971 to current year.
Equipment.--	Graphic water stage-recorder and Sutron Satlink 2 DCP satellite monitoring connected to a Sutron Stage-Discharge Recorder (SDR) unit. Recorders are on separate floats in a concrete shelter and well. The primary reference gage is an electric drop tape in the gage house. No outside staff gage. Control is an 8-foot Parshall flume set in a 60-foot wide concrete structure that acts as a weir at higher flows. No other changes this water year.
Hydrologic Conditions.--	Cobble and gravel are deposited in the stilling pool above the control throughout the water year. At least once per year the USBR removes sediment deposited above the control section. Approximately 250 feet above the control is a USBR diversion dam (Oso Diversion structure) for the San Juan/Chama Project. The San Juan/Chama Project is a trans-basin diversion that diverts water through a pipeline and is delivered to the Rio Grande River basin in New Mexico.
Gage-Height Record.--	The primary record is 15-minute SDR data downloaded from satellite telemetry with chart record and DCP data used for backup purposes. The gage was visited on 20 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The gage is visited almost daily (during normal business hours) by the USBR/Chama personnel. USBR personnel will adjust the graphic water stage-recorder but do not make adjustments to the SDR. The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice on the control: Nov. 23, 25, 27-30; Dec. 1, 2, 2010; Jan. 1-12, 24, 26; Feb. 3-15, 2011 . The SDR unit had a conflict with the DCP for the period of Oct. 1 - 13, 2010 (extending into the previous water year) where the 15-min punch at 2345 each day was not logged in the DCP for transmission. This is caused by the SDR unit tallying the day's totals at 0000 and not communicating with the DCP. The 2345 punch was estimated for each of these days, and did not have an affect on the daily discharge; the punches at 2330 and 0000 were averaged to determine the estimated gage height. The issue was resolved by making the unit take a 3-second average for determining gage height, eliminating the communication conflict with the DCP.
Datum Corrections.--	Levels were run on October 14, 2010. No corrections were made since the ET index elevation was within the allowable error tolerances. Levels were also run to the two other reference marks (RM#3 and RM#4). RM#3 was found to be reading -0.001 feet low. RM#4 was found to be reading -0.001 feet low. No corrections were made to gage heights of measurements or charts.
Rating.--	The control is an 8-foot Parshall flume installed in September 1979 to replace a V-notch weir. At an elevation of 3.00 ft, horizontal concrete wing walls extend in both directions for a total of 60 feet. Rating No. 4 was developed and put into use on October 1, 2003. It is fairly well defined between 22 cfs and 285 cfs. It was used all year. Eighteen measurements (Nos. 820 – 837) were made during the current water year ranging in discharge from 36.8 cfs to 89.6 cfs. They cover the range in discharge experienced except for the lower average daily flows of Oct. 1-7, 12-20; Nov. 10, 12-30; Dec. 1-19, 24-31, 2010; Jan. 1-31; Feb. 1-28; Mar. 1, 5; Aug. 17-20, 2011, and the higher average daily flows of May 3-4, 6-9, 29-30; Jun. 7; Sep. 9, 16-18, 2011. The peak instantaneous flow of 265 cfs occurred at 1230 on April 19, 2011 at a gage height of 3.21 feet with a shift of +0.04 feet. It exceeded measurement No. 828, made May 9, 2011, by 1.32 feet in stage.
Discharge.--	Shifting control method was used all year. Shifting is mainly caused by erosion and deposition of small to medium gravels in the approach section of the flume and by the accumulation of trash and debris on the wing walls. Shifts were applied as defined by measurements, flume cleaning, and flow events; they were distributed by time. Measurements show unadjusted shifts varying from 0.00 to +0.07 ft. Shifts from measurements were applied directly and given full weight except for Measurement No. 833, which was discounted +1.09% to smooth shift distribution. Two measurements were made during ice effect, Meas. Nos. 822 and 823. The shifts from these measurements were not applied in the record.
Special Computations.--	Discharge during ice-affected periods was estimated by considering baseflow discharge on either side of affected record period and smoothing the record between. Temperature and discharge data from Navajo River at Banded Peak Ranch (NAVANCO), located 6 miles upstream was the primary means of estimating discharge variation around the baseflow during ice-affected days.
Remarks.--	Record good, except for those periods of ice affect and when water stage in the channel approaches the top of the flume or spills over the weir which should be considered poor. Station maintained and record developed by Brian Leavesley.
Recommendations.--	Levels should be run again in WY2012.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09344400 NAVAJO RIVER BELOW OSO DIVERSION DAM NEAR CHROMO

RATING TABLE.-- NAVOSOCO04 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

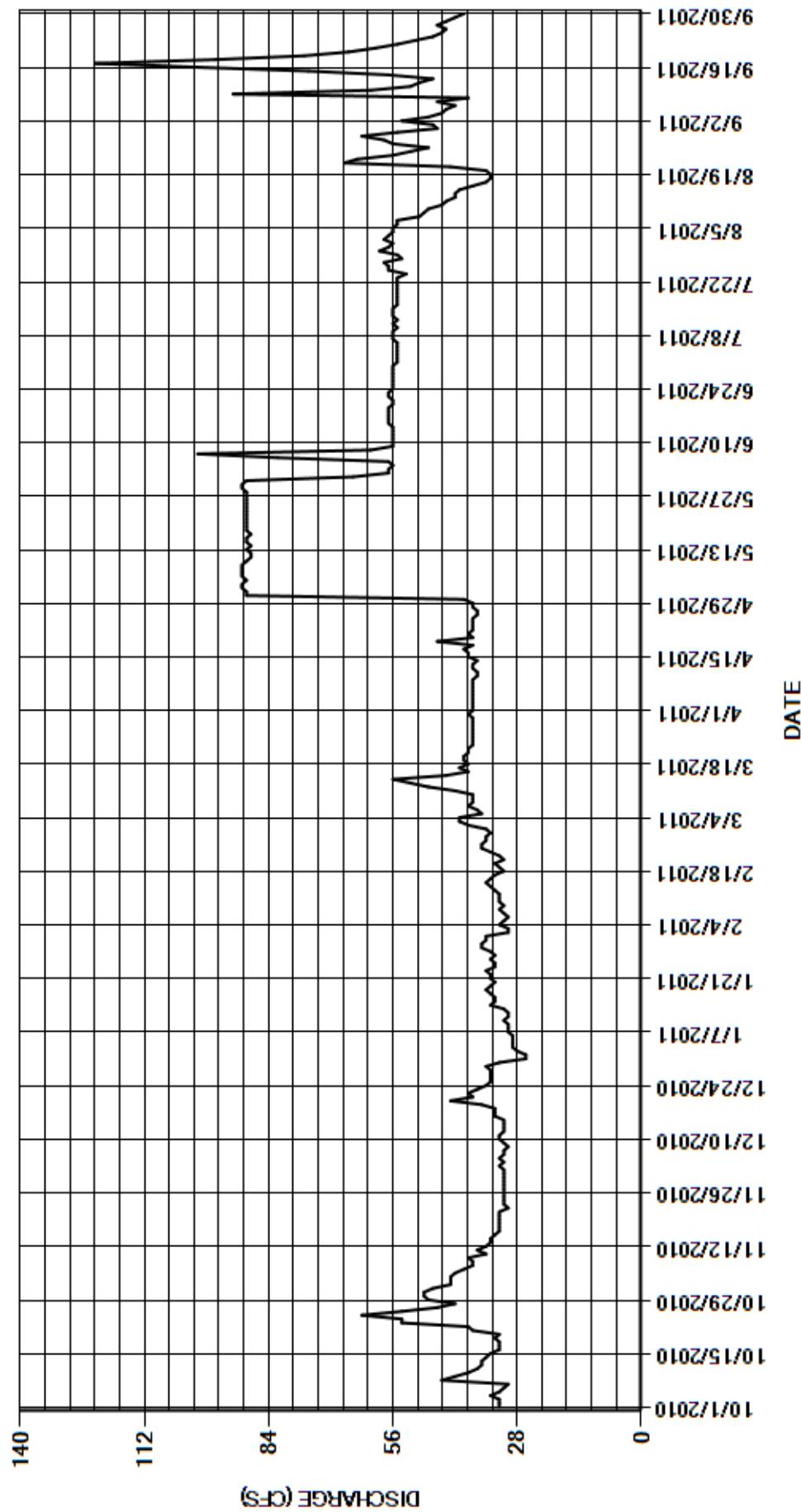
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	32	47	e31	e26	35	35	38	89	65	55	56	47
2	32	43	e31	e28	30	39	38	89	57	55	58	54
3	32	43	32	e29	e30	41	38	90	57	55	57	48
4	34	43	31	e29	e32	41	38	90	56	55	56	45
5	32	42	32	e29	e31	36	38	89	57	55	56	44
6	31	40	31	e29	e30	37	38	90	82	55	55	42
7	30	38	31	e30	e31	39	38	90	100	56	55	46
8	45	38	30	e30	e32	38	38	90	61	56	50	39
9	42	39	31	e30	e31	38	38	90	56	56	49	92
10	39	35	32	e31	e32	38	37	89	56	55	48	61
11	37	37	32	e30	e32	42	37	88	56	56	45	52
12	36	35	31	e30	e32	48	38	88	56	55	44	50
13	36	34	31	31	e33	52	38	89	56	56	42	47
14	35	34	31	34	e34	56	37	88	56	56	42	57
15	34	33	31	33	e35	44	39	89	57	56	41	75
16	32	32	33	33	34	39	39	89	57	55	38	100
17	32	32	33	34	33	41	40	88	57	55	35	123
18	32	32	33	35	31	39	38	89	57	55	34	96
19	33	32	36	34	32	40	46	89	57	55	34	76
20	32	32	43	33	33	40	38	89	56	55	35	66
21	38	32	38	34	31	39	39	89	56	55	43	60
22	39	30	39	34	32	39	38	89	57	55	67	55
23	54	e31	37	35	34	38	38	89	57	55	64	51
24	54	31	35	e33	36	38	38	89	56	53	56	47
25	63	e31	34	33	36	38	38	89	56	57	52	45
26	54	31	34	e34	35	38	37	89	56	57	48	44
27	46	e31	34	33	35	38	37	89	56	58	56	46
28	42	e31	34	34	34	38	38	89	56	54	58	44
29	48	e31	35	36	---	38	38	90	56	55	63	42
30	49	e31	32	36	---	38	40	90	56	59	55	40
31	49	---	26	35	---	39	---	89	---	57	46	---
TOTAL	1224	1051	1024	995	916	1244	1150	2763	1774	1722	1538	1734
MEAN	39.5	35.0	33.0	32.1	32.7	40.1	38.3	89.1	59.1	55.5	49.6	57.8
AC-FT	2430	2080	2030	1970	1820	2470	2280	5480	3520	3420	3050	3440
MAX	63	47	43	36	36	56	46	90	100	59	67	123
MIN	30	30	26	26	30	35	37	88	56	53	34	39
CAL YR	2010	TOTAL	17462	MEAN	47.8	MAX	254	MIN	26	AC-FT	34640	
WTR YR	2011	TOTAL	17135	MEAN	46.9	MAX	123	MIN	26	AC-FT	33990	

MAX DISCH: 265 CFS AT 12:30 ON APR 19,2011 GH 3.21 FT SHIFT 0.04 FT

MAX GH: 3.21 FT AT 12:30 ON APR 19,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

0934400 NAVAJO RIVER BELOW OSO DIVERSION DAM NEAR CHROMO
WY2011 HYDROGRAPH



SAN JUAN RIVER BASIN
LITTLE OSO DIVERSION NEAR CHROMO
Water Year 2011

Location.--	Lat. 37°04'32", Long. 106°48'38", in SW 1/4 SE 1/4 sec. 23, T.33 N., R.1 E., NMPM, Archuleta County.
Drainage Area and Period of Record.--	N/A. March 1971 to current year.
Equipment.--	Sutron Satlink 2 DCP and a digital shaft encoder in a concrete control house used by the Bureau of Reclamation (Bureau) to house the telemetry for control of the Little Oso diversion structure. The Bureau utilizes a Stevens A-71 chart recorder with an attached signal converter to send stage data to their SCADA system. Shaft encoder is set to an inside electric tape. The primary reference gage is an electric drop tape inside the well. Control is a 6-foot concrete Parshall flume set into the diversion tunnel below ground. It was found that there is an issue with the wiring causing a power deficiency. In previous water years it was noticed that at on site visits, if the shaft encoder display is left on, there is not enough power to transmit a signal to the DCP. No changes this water year.
Hydrologic Conditions.--	The Little Oso Diversion is part of the San Juan-Chama Project. It is a transmountain diversion structure which creates an on-stream reservoir on the Little Navajo River to collect runoff and settle out sediment. Water can be released downstream by means of either a vertical Tainter slide gate or an adjustable Cipoletti weir or the slide gate. The water above the dam can be taken into the Azotea Tunnel which conveys water to the Rio Grande Basin. Diversion amounts are limited by the minimum downstream flow requirements of the Little Navajo River and the capacity of the tunnel. The Blanco diversion on the Rio Blanco is located above the Little Oso. The Oso diversion on the Navajo River is below. The Parshall flume is located within the diversion tunnel. It is typically a seasonal diversion where the Bureau attempts to capture and divert the maximum amount of spring runoff while adhering to minimum release requirements set forth in legislation for the San Juan-Chama Project and agreements between the Bureau and State of Colorado. Since the diversion primarily operates in the Spring and Summer, ice does not affect the control.
Gage-Height Record.--	The primary record is 15-minute shaft encoder data downloaded from satellite telemetry with the DCP and chart record used for backup purposes. The gage was visited on twelve (12) separate occasions by DWR staff to ensure that the shaft encoder remained calibrated to the primary reference gage. No datum corrections took place during the water year. However, during WY10, the Bureau changed the tape length and as close as can be determined by DWR, that change in tape length was -0.07 ft. In WY10, a +0.07 ft datum correction was run for the diversion season. Upon levels being run in the tunnel in WY12, DWR determined that the tape is 0.05 ft shorter than it should be. A +0.05 ft datum correction was used for the entire period of record in current WY11. The gage height record is complete and reliable for the entire period of record.
Datum Corrections.--	Levels have not been run at this site before. Levels were run on the flume within the diversion tunnel on Nov 10, 2011. At this time the tape length was determined to be 0.05 ft too short) A datum correction of +0.05 ft was run for the entire WY2011 record.
Rating.--	The control is a standard 6-ft. concrete Parshall flume. Rating No. 1 (LOSODVCO01), a standard 6-ft. Parshall flume rating above a gage height of 0.15 ft, was used the entire water year. The flows below a gage height of 0.15 ft. are assumed to be 0. This is caused by either the intake to the stilling well being 0.15 ft. above the floor of the flume or the stilling well does not provide sufficient depth. No measurements were made this water year because the flume is located underground. The peak flow of 43.4 cfs occurred at 1830 on May 29 2011 at a gage height of 1.45 ft, with a shift of 0.00 ft.
Discharge.--	For safety reasons, no measurement of this diversion has taken place. The discharge record was computed by application of a variable shift to the rating for the gage height record. The purpose of the VS was to zero out the days with no diversion but in which the datum correction of +0.05 ft made the record show diversion.
Special Computations.--	No special computations in WY2011.
Remarks.--	Record is rated as fair for the entire period of record. A fair rating was given due to the fact that measurements have never taken place due to the inaccessibility of the flume. Station maintained and record developed by Brian Leavesley.
Recommendations.--	Levels should be run at this site. Power issues should be resolved within the control house to allow for the installation of a SDR unit in place of the shaft encoder unit.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

LITTLE OSO DIVERSION NEAR CHROMO

RATING TABLE-- LOSODVCO01 USED FROM 01-OCT-2010 TO 30-SEP-2011

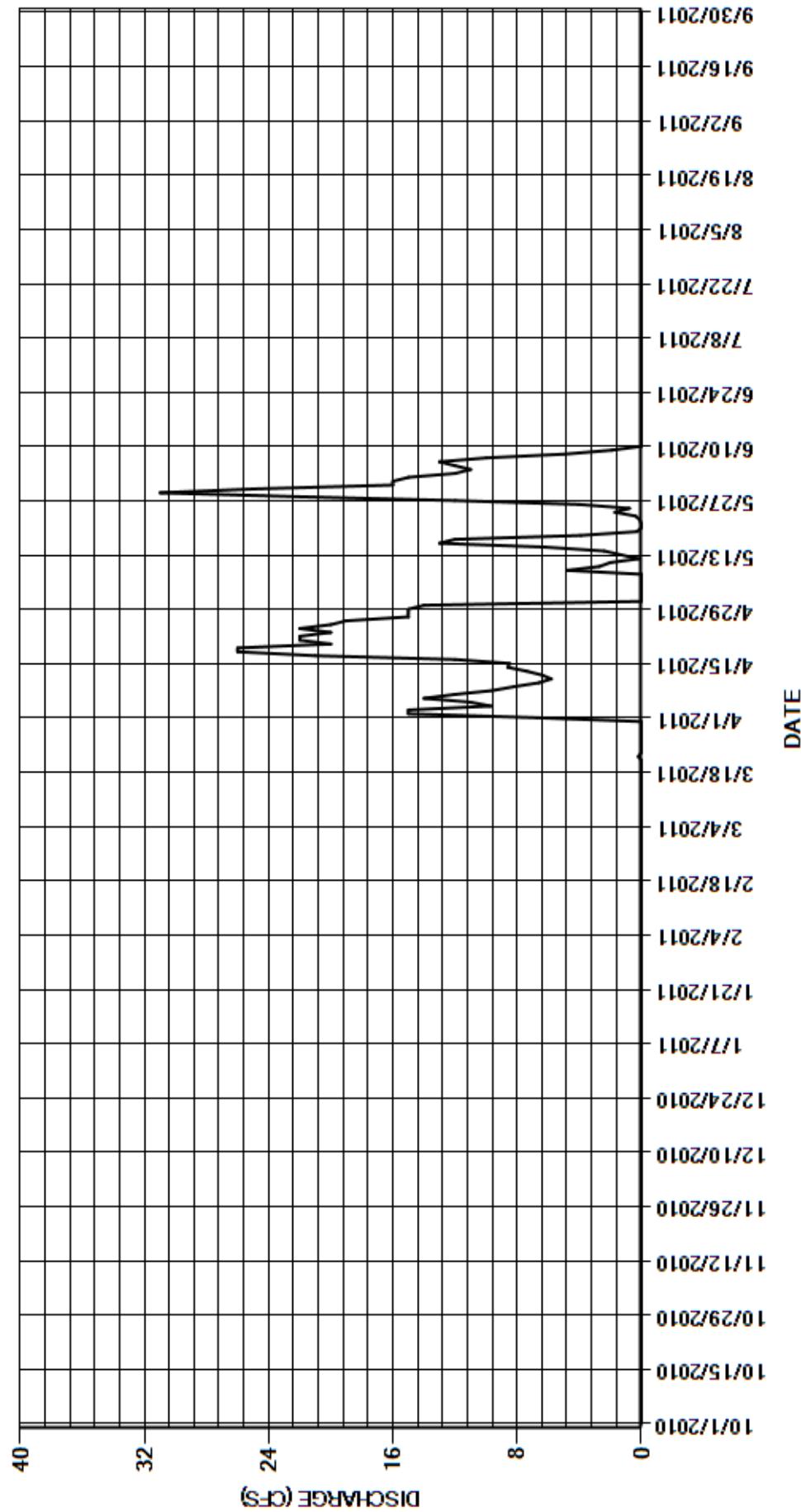
DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011												
DAY	MEAN VALUES											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	6.7	0.00	16	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	15	0.00	15	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	15	0.00	12	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	9.7	0.00	11	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	11	0.00	12	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	14	0.00	13	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	12	0.00	10	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	9.6	0.00	4.9	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	8.2	4.8	1.9	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	6.6	2.7	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	5.8	2.0	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	6.4	0.18	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	7.4	1.3	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	8.6	2.4	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	8.5	6.2	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	12	13	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	21	12	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	26	3.9	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	26	0.28	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	20	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	22	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.19	22	0.09	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	20	0.37	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	22	1.7	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	20	0.77	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	19	4.0	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	15	12	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	15	22	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	15	31	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	14	25	0.00	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	16	---	0.00	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.19	433.5	161.69	95.80	0.00	0.00	0.00
MEAN	0.000	0.000	0.000	0.000	0.000	0.006	14.4	5.22	3.19	0.000	0.000	0.000
AC-FT	0	0	0	0	0	0.4	860	321	190	0	0	0
MAX	0.00	0.00	0.00	0.00	0.00	0.19	26	31	16	0.00	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	5.8	0.00	0.00	0.00	0.00	0.00
CAL YR	2010	TOTAL	1362.49	MEAN	3.73	MAX	88	MIN	0.00	AC-FT	2700	
WTR YR	2011	TOTAL	691.18	MEAN	1.89	MAX	31	MIN	0.00	AC-FT	1370	

MAX DISCH: 43.4 CFS AT 18:30 ON MAY 29,2011 GH 1.45 FT SHIFT 0 FT

MAX GH: 1.45 FT AT 18:30 ON MAY 29,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LITTLE OSO DIVERSION NEAR CHROMO
WY2011 HYDROGRAPH



SAN JUAN RIVER BASIN
LITTLE NAVAJO RIVER BELOW LITTLE OSO DIVERSION DITCH
Water Year 2011

Location.--	Lat. 37°04'37.8", Long. 106°48'41.3", in SW 1/4 SE 1/4 sec. 23, T.33 N., R.1 E., NMPM, Archuleta County, on right bank downstream from Little Oso Diversion Dam.
Drainage Area and Period of Record.--	Drainage area = 13.4 mi ² , December 5, 1996 to current year.
Equipment.--	Graphic water stage-recorder and Sutron Satlink 2 DCP connected to a Sutron stage-discharge recorder (SDR) on separate floats in a wooden shelter and concrete well. The primary reference gage is a drop tape in the gage with an outside staff gage used for supplemental purposes. Control is a steel 5-foot Parshall flume set in concrete. A new roof and siding was put on the gage house this water year.
Hydrologic Conditions.--	The channel is straight for approximately 80-ft up and downstream of the control. The gage is located approximately 200-ft downstream of the Little Oso Diversion Dam. A large CMP culvert is located approximately 80-ft downstream of the gage. Snow, ice, trash and debris can collect in front of the CMP culvert and submerge the flume. The channel consists of small cobbles and sand.
Gage-Height Record.--	The primary record is 15-minute shaft encoder data downloaded from satellite telemetry with DCP downloaded data as backup; chart record exists for additional backup purposes. The gage was visited on 19 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The SDR unit was adjusted 6 times throughout the water year. Corrections were made Oct 13 (-0.02 ft), Mar 2 (+0.02 ft), Apr 5 (+0.01 ft), May 25 (-0.01 ft), Jul 27 (+0.01 ft), and Sep 12 (-0.02 ft). Record is complete and reliable except for the following days when ice on the control affected the stage-discharge relationship. Ice on the control: Oct. 27, Nov. 23-30, Dec. 1-2, 25-26, 31, 2010; Jan. 1-14, 26-31, Feb. 1-7, 9-17, 20, 23, Mar. 1-2, 4-6, 9-12, 14-15, 2011. The well heater was not working towards the end of Nov. and was replaced on Nov 29. These days are possible 'a'-days, but included under 'b'.
Datum Corrections.--	No levels were run this year. Levels have never been run at this gage.
Rating.--	The control is a 5-foot Parshall flume installed in October 1996 to supplement an inverted Cipolletti weir at the Bureau's diversion structure. Sandbars above the flume cause some shifting. Rating No. 1, a standard 5 foot Parshall flume rating, was used for the entire period of record. Thirteen measurements (Nos. 208-220) were made during the current water year ranging in discharge from 0.64 cfs to 30.0 cfs. The measurements cover the entire range-in-stage experienced except for the higher average daily flows of May 7-9, 11, and 27, 2011. The instantaneous peak flow of 46.0 cfs occurred at 2100 on May 8, 2011 at a gage height of 1.74 ft with a shift of -0.05 ft. It exceeded measurement No. 215, made May 9, 2011, by 0.40 ft in stage.
Discharge.--	Shifting control method was used during the entire water year. Shifts were applied as defined by measurements and were distributed by time with consideration of stage and events. Changes in shift were prorated across flow events such as rainfall and reservoir operations at the diversion. Shifting is mainly caused by erosion and deposition of sand and silts on the approach section above the flume. The USBR periodically opens the gate to the diversion stilling basin above the station and releases a large amount of silt and gravel upstream of the flume. Measurements show shifts varying from -0.02 to -0.07 feet. Shifts were applied directly and given full weight except Measurement Nos. 216, 217, 218, and 220, which were discounted from -4% to +6% to smooth shift distribution. There were no measurements that were ice affected this water year.
Special Computations.--	Discharge for periods of ice-affected record was estimated on the basis of good record before and after ice, temperature records from the Navajo River at Banded Peak Ranch gaging station and partial days of good record.
Remarks.--	Record is rated fair, except for those periods of ice affected record, which are estimated and considered poor. Station maintained by Brian Leavesley and Sherry Schutz and record developed by Brian Leavesley.
Recommendations.--	Benchmarks should be established and levels should be run at the gage. The level of the flume should be checked as well.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

LITTLE NAVAJO RIVER BELOW LITTLE OSO DIVERSION DITCH

RATING TABLE-- LITOSOCO01 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

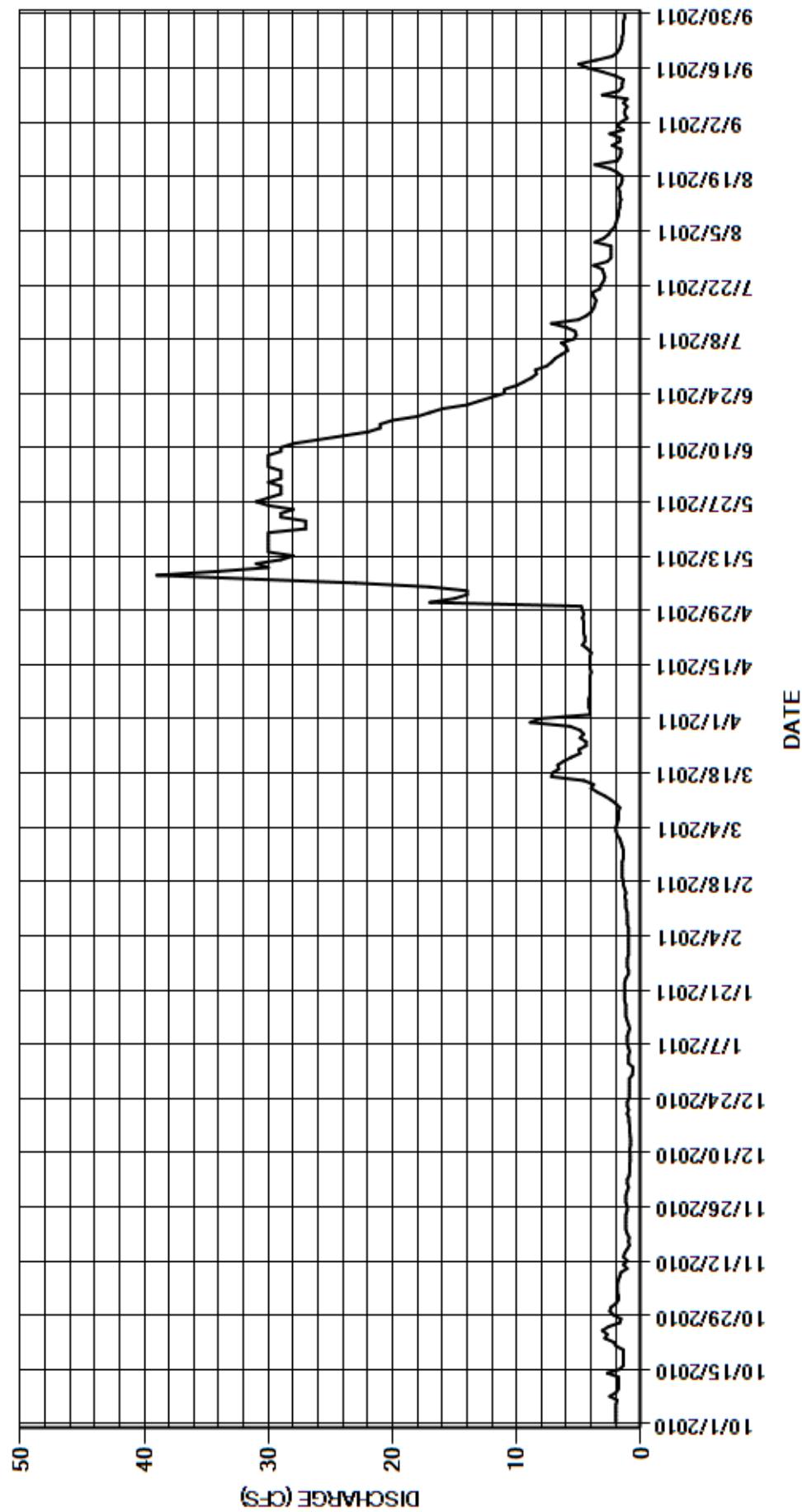
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.0	2.0	e1.0	e0.65	e1.0	e1.7	8.1	17	30	7.6	2.4	1.9
2	2.0	1.8	e1.1	e1.0	e1.0	e1.9	4.1	15	29	7.2	3.7	1.6
3	2.0	1.8	1.1	e1.0	e1.0	2.0	4.1	14	29	6.9	3.0	1.1
4	2.0	1.9	0.94	e1.0	e1.0	e2.0	4.2	14	29	6.4	2.6	1.3
5	2.0	1.9	0.90	e0.90	e1.0	e1.9	4.2	17	30	5.9	2.4	1.3
6	2.0	1.9	0.90	e1.0	e1.0	e1.8	4.2	23	30	6.0	2.1	1.1
7	1.9	1.8	0.90	e1.1	e1.1	1.8	4.1	31	30	6.4	2.0	1.4
8	2.5	1.7	0.85	e1.1	1.1	1.8	4.1	39	30	5.4	1.9	1.1
9	2.0	1.6	0.87	e1.1	e1.1	e1.7	4.1	34	29	5.2	1.8	3.1
10	1.8	1.1	0.88	e1.0	e1.1	e2.0	4.1	30	29	5.3	1.8	1.8
11	1.8	1.4	0.88	e0.90	e1.2	e2.4	4.1	31	28	6.0	1.7	1.5
12	1.8	1.1	0.83	e1.0	e1.2	e2.9	4.1	29	26	7.2	1.7	1.5
13	1.8	1.4	0.82	e1.1	e1.2	3.5	4.0	28	24	5.0	1.6	1.4
14	2.7	1.3	0.85	e1.2	e1.3	e4.0	4.1	30	22	4.4	1.7	2.1
15	1.7	1.1	0.88	1.2	e1.2	e3.8	4.1	30	21	4.0	1.7	3.1
16	1.4	0.92	0.89	1.2	e1.3	4.6	4.1	30	21	3.8	1.8	4.3
17	1.4	1.0	0.91	1.2	e1.4	7.2	4.1	30	20	3.7	1.6	5.0
18	1.4	0.94	0.96	1.3	1.4	7.1	4.0	30	18	3.6	1.5	3.6
19	1.4	1.1	0.97	1.3	1.5	6.6	4.3	30	17	3.8	1.5	2.3
20	1.4	1.2	1.1	1.3	e1.5	6.7	4.7	27	16	3.9	1.9	1.9
21	2.0	1.2	0.98	1.3	1.5	6.2	4.5	27	14	3.3	2.5	1.7
22	2.2	1.2	1.1	1.3	1.5	5.6	4.5	27	13	3.2	3.7	1.6
23	2.9	e1.2	1.1	1.3	e1.5	4.9	4.6	29	12	3.0	1.9	1.5
24	2.7	e1.2	0.94	1.2	1.4	5.0	4.6	29	11	2.9	1.7	1.5
25	3.1	e1.1	e0.94	1.0	1.4	4.4	4.6	28	11	3.0	1.6	1.4
26	2.6	e1.1	e0.93	e1.0	1.4	4.4	4.6	30	10	3.1	1.6	1.4
27	e1.7	e1.2	0.93	e1.1	1.5	4.9	4.7	31	9.4	3.8	2.3	1.4
28	1.6	e1.2	0.93	e1.1	1.6	4.6	4.6	30	8.8	2.7	1.7	1.4
29	2.2	e1.2	0.93	e1.1	---	4.9	4.7	29	8.4	2.4	1.7	1.3
30	2.5	e1.1	0.69	e1.0	---	5.7	4.8	29	8.5	2.4	2.5	1.3
31	2.4	---	e0.65	e1.0	---	8.9	---	29	---	2.4	1.4	---
TOTAL	62.9	40.66	28.65	33.95	35.4	126.9	133.1	847	614.1	139.9	63.0	56.9
MEAN	2.03	1.36	0.92	1.10	1.26	4.09	4.44	27.3	20.5	4.51	2.03	1.90
AC-FT	125	81	57	67	70	252	264	1680	1220	277	125	113
MAX	3.1	2.0	1.1	1.3	1.6	8.9	8.1	39	30	7.6	3.7	5.0
MIN	1.4	0.92	0.65	0.65	1.0	1.7	4.0	14	8.4	2.4	1.4	1.1
CAL YR	2010	TOTAL	2131.21	MEAN	5.84	MAX	36	MIN	0.65	AC-FT	4230	
WTR YR	2011	TOTAL	2182.46	MEAN	5.98	MAX	39	MIN	0.65	AC-FT	4330	

MAX DISCH: 46 CFS AT 21:00 ON MAY 08,2011 GH 1.74 FT SHIFT -0.05 FT

MAX GH: 1.74 FT AT 21:00 ON MAY 08,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LITTLE NAVAJOR RIVER BELOW LITTLE OSO DIVERSION DITCH
WY2011 HYDROGRAPH



SAN JUAN RIVER BASIN
09362750 FLORIDA RIVER ABOVE LEMON RESERVOIR NEAR DURANGO
Water Year 2011

Location.--	Lat. 37°25'36", Long. 107°40'28", in NW 1/4 SE 1/4 sec. 31, T.37 N., R.7 W., NMPM, La Plata County, Hydrologic Unit 1408104, on the left bank 1.7 miles upstream of Miller Creek and 0.1 miles upstream of Willow Creek.
Drainage Area and Period of Record.--	Drainage area = 50.9 mi ² . Published streamflow record Colorado Division of Water Resources July 1, 1972 to present.
Equipment.--	Graphic water stage-recorder and a Sutron Satlink 2 DCP with a shaft encoder on a separate float located in a 72-inch by 72-inch exposed aggregate concrete shelter and a 42-inch corrugated metal pipe well. The floats are located inside of a 14 -inch PVC oil cylinder. A bubbler was installed at the gage on September 16, 2010 to help maintain good record during high flow events and winter periods when ice disks form within the oil cylinder. The station is also equipped with a Sutron air-temperature sensor. The primary reference gage is an electric drop tape with a separate steel drop tape used when the well is frozen around the oil cylinder. No other changes this water year.
Hydrologic Conditions.--	Small boulders and cobble and line the channel above and below the concrete ramp flume. The concrete ramp flume creates a large stilling pool above the control. Lemon Reservoir is below the gage but does not create backwater effect as the gage is well above the pool elevation in the reservoir.
Gage-Height Record.--	The primary record is 15-minute shaft encoder data downloaded from satellite telemetry with DCP download data and chart record used for backup purposes. Missing telemetry data on Dec. 20-22, 2010 was filled in with data downloaded from the DCP. The gage was visited on 19 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. No shaft encoder adjustments or flush corrections were necessary this water year. The record is complete and reliable except for the days when sandbags were placed on the control to repair spalling concrete and ice on the control affected the gage height. Sandbags on the control affected the gage height record Oct. 18-25, 2010. Ice on the control affected the gage height record on Nov. 11-13, 23-30; Dec. 1, 2, 30, 31, 2010; Jan. 1-7, 11-14; Feb. 2-5, 9-12, 2011.
Datum Corrections.--	Levels were run on Sept. 1, 2011 to the electric tape (ET) and drop tape (DT) reference, using BM2 as the base. Bench mark #2 (BM2) is a square chiseled into a large boulder located 3.5 ft. south of the bank operated cableway. Bench mark #3 (BM3) was found to be -0.002 ft. low. Bench mark #4 (BM4) was found to be 0.003 ft. high. Bench mark #5 (BM5) was found to be -0.005 ft. low. The electric tape index was found to be reading correct (0.000). The drop tape index was found to be reading -0.002 ft. low. No changes were made to the ET or DT index as they were found to be reading within acceptable error tolerances. The electric tape length and drop tape length were found to be 0.030 ft. long. No changes were made at the time of levels. The electric and drop tape lengths was also found to be 0.030 ft. long on July 31, 2008. The electric tape and drop tape were adjusted by -0.030 ft. on Nov. 15, 2011. A -0.030 ft. correction was applied to the GH record and all measurement GH's throughout the period of record Oct 1, 2010 to Nov 15, 2011.
Rating.--	On April 2, 2002 a long throated flume, also known as a ramp flume was activated to act as the control section for the gage. The ramp flume is located about 75 feet below the inlets to the old gage and 5 feet below the new gage. Rating No. 7, in use since April 4, 2006, was continued in use for the duration of WY 2011. It is fairly well defined from 5.50 to 999 cfs. Fourteen measurements (Nos. 641-654) were made during the water year. They range in discharge from 8.92 cfs to 621 cfs. They cover the range in stage experienced except for the lower average daily flows of Jan. 30, 31; Feb. 1-5, 9, 10, 14-23, 27, 28; Mar. 1-10, 2011 and the higher average daily flows of June 5-9, 2011. The peak instantaneous flow of 1,030 cfs occurred at 2100 on June 6, 2011 at a gage height of 3.83 ft with a shift of +0.09 ft. It exceeded the stage of measurement No. 649 by 0.54 feet in stage.
Discharge.--	Shifting control method was used during the entire water year. Shifting is caused mainly by aquatic growth on the ramp flume and the fill and scour of sand and gravel above the concrete ramp flume. Measurements show shifts varying from -0.03 to +0.11 feet. Shifts were distributed by time from the beginning of the water year 0000 on Oct. 1, 2010 until 1200 on Apr. 12, 2011 and from 1545 on Sept. 1, 2011 until the end of the water year. Shifts were distributed by stage using variable shift curve FLOALECOVS11A from 1215 on Apr. 12, 2011 until 1530 on Sept. 1, 1011. Shifts were applied directly and given full weight except for measurement Nos. 641, 643, 645, 647, 648, 650 and 652 which were discounted from -7% to 7% to smooth shift distribution.
Special Computations.--	Discharge for periods of ice affect were estimated on the basis of partial day record, interim good record, and temperature data obtained from a temperature sensor at the gage house. No measurements were made during the ice affected period. Discharge for periods affected by the sandbags on the control was estimated by applying the gage height corrections within the record.
Remarks.--	Record good, except for estimated daily discharges during ice affect, which are estimated and poor. Record during the period when sandbags were placed on the control should be considered fair. Station maintained and record developed by Brian Boughton.
Recommendations.--	No recommendations this water year.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09362750 FLORIDA RIVER ABOVE LEMON RESERVOIR NEAR DURANGO

RATING TABLE-- FLOALECO07 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

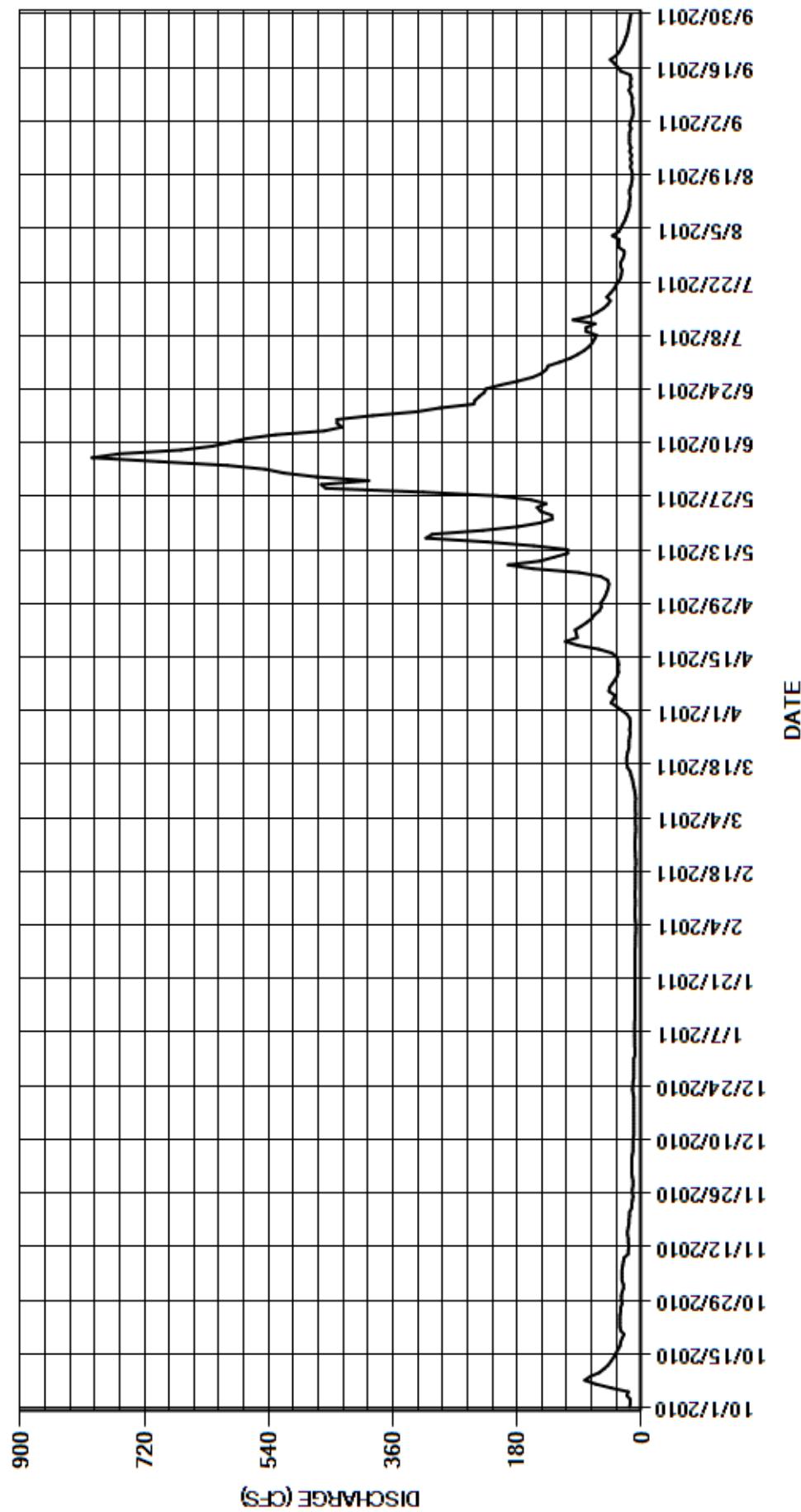
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	26	e14	e9.0	8.5	8.2	28	52	471	118	33	17
2	16	26	e14	e9.0	e8.2	8.4	36	50	518	103	32	15
3	16	28	14	e9.5	e7.8	8.6	44	48	545	92	42	13
4	21	28	14	e9.5	e8.2	8.6	40	47	600	83	33	12
5	19	28	14	e9.5	e8.5	8.2	39	49	699	76	30	12
6	44	28	13	e10	9.3	8.7	47	59	796	71	27	13
7	66	27	12	e10	9.4	8.7	46	90	758	68	24	14
8	82	26	12	10	9.2	8.6	42	157	667	65	22	13
9	74	25	12	9.9	e8.8	8.3	38	193	622	80	20	15
10	61	19	12	9.5	e8.8	8.8	35	147	597	80	18	18
11	54	e19	11	e9.0	e9.0	9.7	33	127	572	67	17	15
12	48	e18	11	e9.0	e9.0	11	34	107	530	99	17	16
13	44	e19	11	e9.2	9.0	12	33	107	459	74	16	15
14	40	19	11	e9.4	8.9	13	34	156	434	64	17	16
15	37	20	11	9.4	8.7	15	36	223	441	55	17	30
16	34	20	11	9.4	8.7	16	43	312	441	49	15	34
17	31	19	11	9.6	8.4	20	62	303	389	45	14	39
18	e30	18	11	9.4	8.4	21	92	230	326	50	13	45
19	e28	18	11	9.4	8.6	21	110	178	292	45	13	37
20	e25	17	11	9.1	7.8	21	93	146	243	40	14	32
21	e30	17	11	9.3	8.1	20	94	129	241	37	16	29
22	e31	14	12	9.2	8.9	18	96	130	235	33	14	26
23	e31	e14	13	9.0	8.8	18	87	146	228	30	16	24
24	e31	e13	12	9.1	9.4	18	79	151	225	29	14	22
25	e31	e12	12	9.5	9.4	17	72	138	204	28	17	20
26	30	e13	11	9.4	9.1	16	68	160	179	30	15	19
27	30	e13	11	9.2	8.8	17	61	208	158	30	17	18
28	28	e12	11	9.0	8.4	16	58	316	145	27	17	17
29	29	e12	11	9.0	---	16	59	457	138	25	17	16
30	29	e13	e11	8.9	---	17	55	464	135	25	17	15
31	28	---	e11	8.8	---	21	---	395	---	33	15	---
TOTAL	1115	581	367	289.2	244.1	438.8	1694	5475	12288	1751	609	627
MEAN	36.0	19.4	11.8	9.33	8.72	14.2	56.5	177	410	56.5	19.6	20.9
AC-FT	2210	1150	728	574	484	870	3360	10860	24370	3470	1210	1240
MAX	82	28	14	10	9.4	21	110	464	796	118	42	45
MIN	16	12	11	8.8	7.8	8.2	28	47	135	25	13	12
CAL YR	2010	TOTAL	23165.3	MEAN	63.5	MAX	671	MIN	5.6	AC-FT	45950	
WTR YR	2011	TOTAL	25479.1	MEAN	69.8	MAX	796	MIN	7.8	AC-FT	50540	

MAX DISCH: 1030 CFS AT 21:00 ON JUN 06,2011 GH 3.83 FT SHIFT 0.09 FT

MAX GH: 3.83 FT AT 21:00 ON JUN 06,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09362750 FLORIDA RIVER ABOVE LEMON RESERVOIR NEAR DURANGO
WY2011 HYDROGRAPH



SAN JUAN RIVER BASIN
FLORIDA RIVER BELOW LEMON RESERVOIR
Water Year 2011

Location.--	Lat. 37°22'50", Long. 107°39'43", in NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 20, T.36 N., R.7 W., NMPM, La Plata County, Hydrologic Unit 1408104, on the right bank next to the emergency spillway at the toe of the dam.
Drainage Area and Period of Record.--	Drainage area = 69.1 mi ² . Published by the USGS (sta. no. 09362900) Oct. 1, 1955 to Sept. 30, 1963, prior to the construction of Lemon Reservoir and located approximately 550 ft. downstream of current location at different datum. Lemon Reservoir completed Dec. 1963. Published streamflow record Colorado Division of Water Resources July 1, 1972 to present.
Equipment.--	Graphic water stage-recorder and a Sutron Satlink 2 DCP with a shaft encoder on a separate float in a 42 inch corrugated metal shelter and well. The primary reference gage is a steel drop tape referenced to a nonadjustable flat head screw set into the wooden instrument shelf. A tipping bucket rain gage (Texas Electronics, TR-525USW) was installed at the gage to measure precipitation. The gage is located within the stilling pool below the reservoir. The control is a concrete broad crested weir located approximately 200 ft. below the gage. A bank operated cableway is located approximately 400 ft. below the gage.
Hydrologic Conditions.--	The weir below Lemon Reservoir creates a large stilling pool below Lemon Reservoir dam. Flow in the channel is controlled by releases from the reservoir.
Gage-Height Record.--	The primary record is 15-minute shaft encoder data from satellite telemetry with DCP download data and graphic chart record for backup purposes. The gage was visited on 16 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was not adjusted this water year. The record is complete and reliable.
Datum Corrections.--	Levels were run this water year on September 1, 2011 to the nonadjustable reference (RP), located inside the gage shelter using BM1 as the base. The drop tape reference point was found to be reading -0.002 ft. low. The drop tape reference was not adjusted as it was found to be within the allowable error tolerances. The drop tape length was reading correct and not adjusted.
Rating.--	The control is a concrete broad-crested weir located 200 ft. below the gage. Shifts occur as a result of moss growth on the weir. Rating No. 2, dated Jan. 11, 1977, was continued in use this year. It is well defined from 0.6 to 980 cfs. The point-of-zero-flow (PZF) was not measured this water year. The PZF is approximately 1.13 ft. Sixteen measurements (Nos. 516 - 531) were made during the current water year ranging in discharge from 10.1 cfs to 234 cfs. These measurements cover the range in stage experienced except for the lower average daily flows on Oct. 1-30; Nov. 1-6, 14-30; Dec. 1-31, 2010; Jan. 1-30; Feb. 3-5; Mar. 5-31; Apr. 1-30; May 1, 2, 5-7; Sep. 22-30, 2011 and the higher average daily flows of Jun. 7, 9-14, 2011. The peak instantaneous flow of 243 cfs occurred at 2300 on June 9, 2011 at a gage height of 3.20 ft. with a shift of +0.04 ft. It exceeded the stage of measurement No. 526, made June 16, 2011 by 0.03 ft.
Discharge.--	Shifting control method was used, for the entire water year. Shifts were applied as defined by measurements and were distributed by time and stage. The shift at the end of water year 2010 was -0.03 ft. and continued to the beginning of the stock water run at 1745 on Nov. 7, 2010. Shifts were distributed by time holding a +0.03 ft. shift through the stock water run (based on Meas. Nos. 517-518) from 1800 on Nov. 7, 2010 until 1715 on Nov. 13, 2010. Shifts were distributed by time from +0.03 ft. at 1730 on Nov. 13, 2010 to -0.04 ft. at 1815 on Nov. 13, 2010. Shifts were distributed by time from -0.04 ft. at 1830 on Nov. 13, 2010 to -0.04 ft. at 1400 on Apr. 26, 2011 (Meas. No. 523). Shifts were distributed by stage using variable shift curve FLOBLECOVS11A from 1415 on Apr. 26, 2011 until the end of the water year. Open water measurements show unadjusted shifts varying from -0.05 ft. to +0.07 ft. Shifts were applied directly and given full weight except for Measurement Nos. 516, 517, 518, 519, 520, 522, 529 and 531 which were discounted -5% to 8% to smooth shift distribution.
Special Computations.--	No special computations were necessary this water year.
Remarks.--	Record good. Station maintained and record developed by Brian Boughton.
Recommendations.--	None.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
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FLORIDA RIVER BELOW LEMON RESERVOIR

RATING TABLE-- FLOBLECO02 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

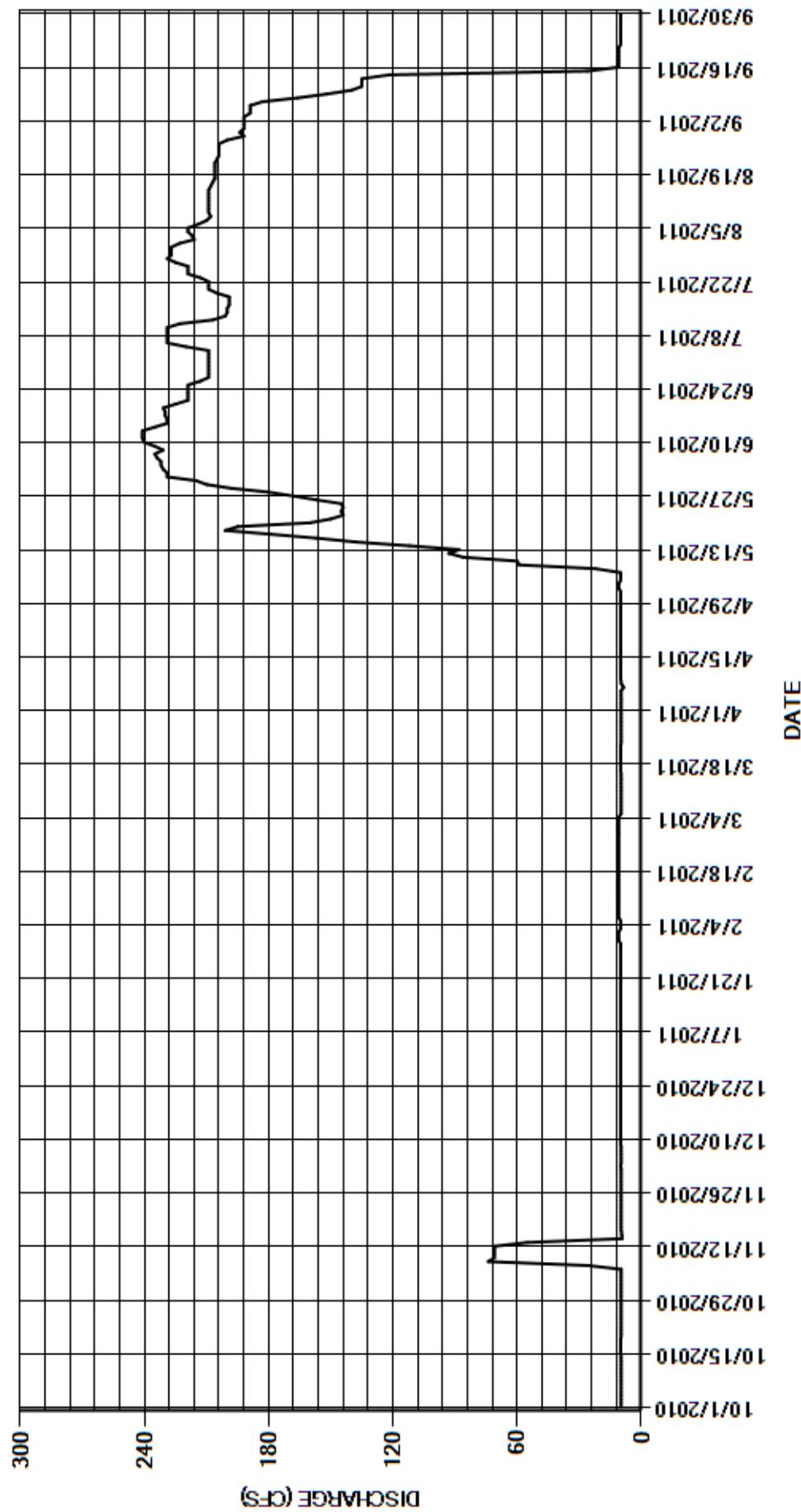
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.7	9.7	9.7	10	11	11	9.7	10	229	209	223	192
2	9.7	9.7	9.7	10	11	11	9.7	10	229	209	216	192
3	9.7	9.7	10	10	10	11	9.7	11	231	209	217	192
4	9.7	9.7	9.7	10	10	11	9.7	11	232	209	219	189
5	9.7	9.7	9.7	10	10	9.8	9.8	10	232	220	219	189
6	9.7	9.7	9.7	10	11	9.7	9.9	10	234	229	214	189
7	9.7	26	9.8	10	11	9.7	8.6	10	235	229	210	183
8	9.7	74	9.8	10	11	9.7	9.7	22	231	229	208	166
9	9.7	71	10	10	11	9.7	9.9	59	235	229	209	152
10	9.7	71	10	10	11	9.7	10	60	240	229	209	140
11	9.7	71	10	10	11	9.7	10	86	241	223	209	135
12	9.7	71	10	10	11	9.7	10	93	241	207	209	135
13	9.7	55	10	9.9	11	9.8	10	88	241	201	209	135
14	9.8	9.3	10	10	11	9.7	10	112	235	200	209	122
15	9.9	9.5	10	10	11	9.8	10	138	229	200	209	26
16	10	9.7	10	10	11	9.9	10	157	229	199	208	11
17	10	9.7	10	10	11	10	10	179	230	199	207	11
18	10	9.7	10	10	11	10	10	201	230	199	206	11
19	9.9	9.7	10	10	11	10	10	195	231	205	206	11
20	9.7	9.7	10	10	11	10	10	160	225	209	206	11
21	9.7	9.7	10	10	11	10	10	150	219	209	206	11
22	9.7	9.7	10	10	11	10	10	144	219	209	206	10
23	9.7	9.7	10	10	11	9.9	10	145	219	213	205	10
24	9.7	9.7	10	10	11	9.7	10	144	219	219	204	10
25	9.7	9.7	10	10	11	9.7	10	145	219	219	204	10
26	9.7	9.7	10	10	11	9.7	10	157	213	219	204	10
27	9.7	9.7	10	10	11	9.7	10	168	209	225	204	10
28	9.7	9.7	10	10	11	9.7	10	180	209	229	200	10
29	9.7	9.7	10	10	---	9.7	10	198	209	227	192	10
30	9.7	9.7	10	10	---	9.7	10	210	209	227	194	10
31	9.7	---	10	11	---	9.7	---	215	---	227	192	---
TOTAL	302.1	661.5	308.1	310.9	305	308.4	296.7	3478	6804	6666	6433	2493
MEAN	9.75	22.0	9.94	10.0	10.9	9.95	9.89	112	227	215	208	83.1
AC-FT	599	1310	611	617	605	612	589	6900	13500	13220	12760	4940
MAX	10	74	10	11	11	11	10	215	241	229	223	192
MIN	9.7	9.3	9.7	9.9	10	9.7	8.6	10	209	199	192	10
CAL YR	2010	TOTAL	24310.6	MEAN	66.6	MAX	248	MIN	7.0	AC-FT	48220	
WTR YR	2011	TOTAL	28366.7	MEAN	77.7	MAX	241	MIN	8.6	AC-FT	56270	

MAX DISCH: 243 CFS AT 23:00 ON JUN 09,2011 GH 3.20 FT SHIFT 0.04 FT

MAX GH: 3.20 FT AT 23:00 ON JUN 09,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

FLORIDA RIVER BELOW LEMON RESERVOIR
WY2011 HYDROGRAPH



SAN JUAN RIVER BASIN
09357500 ANIMAS RIVER AT HOWARDSVILLE, CO
Water Year 2011

Location.--	Lat. 37°49'59", Long. 107°35'56", in SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 2, T.41 N., R.7 W., NMPM, San Juan County, Hydrologic Unit 14080104, on the right bank 0.25 mi downstream of Cunningham Creek, 1.66 miles upstream of Arrastras Creek.
Drainage Area and Period of Record.--	Drainage area = 55.9 mi ² ; Period of record: USGS published record October 1935 to September 1982; Colorado Division of Water Resources published record October 1982 to present.
Equipment.--	Graphic water stage-recorder and a Sutron Satlink 2 DCP with a shaft encoder on a separate float in a 36"x 36" wooden shelter and well. The primary reference gage is a steel drop tape referenced to an adjustable reference point (RP). An air temperature sensor is located at the gage as well. The control is a cobble riffle located approximately 50-ft. below the gage.
Hydrologic Conditions.--	Drainage area consists of forested mountains with many rocky peaks above 11,000 ft. in elevation. Cobbles and boulders line the channel above and below the gage. Avalanches above the gage can diminish the flows at the gage but the events are typically short lived.
Gage-Height Record.--	The primary record is 15-minute shaft encoder data downloaded from satellite telemetry with the DCP and chart record for backup purposes. The gage was visited on 18 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted 5 times this water year: +0.01 ft on Nov 30, -0.01 ft on Jan 12, -0.01 ft on Apr 21, +0.01 ft on May 16, and -0.01 ft on Sep 2. The corrections were prorated and distributed by time to the last known matching reading (typically the last station visit). The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice on the control: Nov. 21-27, 30, Dec. 8, 24-31, 2010; Jan. 1-12, 20-30, Feb. 1-4, 9-13, 15, 17, 20-23, 28, Mar. 1, 5, 9-12, 23, 26, and Apr. 11, 2011. It was noticed that the SE wheel will ice up causing the tape to become dislodged from the pins. When corrected, it is difficult to determine where to begin the correction, but it typically occurs after a number of days in a row in ice.
Datum Corrections.--	Levels were run on September 2, 2011, using BM1 as the base. No corrections were made as the elevation of the drop tape index and drop tape length were both found to be within allowable tolerances.
Rating.--	One channel at all stages. The control is a large cobble riffle located below the station. The channel controls at high flow. Gravel and sand fill and scour, causing shifts. Rating No. 09, instituted on May 13, 2009, was used for the entire water year. It was necessary to extend the rating table this WY to include the peak gage height. Seventeen measurements (Nos. 1199 - 1215) were made during the current water year ranging in discharge from 14.6 to 770 cfs. They cover the range in stage experienced except for the lower average daily flows of Feb. 15-28 and Mar. 1-12, 2011 and the higher average daily flows of June 6-7, 10-12, 15-17, 23-25, 2011. The peak flow of 1290 cfs occurred at 2145 on June 16, 2011 at a gage height of 3.66 ft. with a shift of +0.10 ft. The peak exceeded measurement No. 1210 by 0.65 ft. in stage.
Discharge.--	Shifting control method was used during the entire water year. Shifting is caused mainly by erosion and deposition of small cobble and gravels on the control section below the gauge. Shifts were applied as defined by measurements and were distributed by time and stage. Shifts were distributed by time from 0000 Oct. 1, 2010 until the 1st measurement 1230 Oct. 4, 2010. Shifts were distributed by stage using shift curve ANIHOWVS11A from 1245 Oct. 4, 2010 until the peak at 2145 Jun. 16, 2011. The descending limb of the hydrograph was defined by measurements 1210 to 1216 and shift curve ANIHOWVS11B. Shift curve 11B was applied from the peak (2200 Jun. 16, 2011) through the end of the water year. Unadjusted measurements show shifts varying from -0.04 to 0.13 ft. All were given full weight and applied directly except for Measurement Nos. 1199, 1201, 1202, 1203, 1206, 1209, and 1211 which were discounted from -5% to +7% to smooth shift distribution. There were no measurements in WY11 that appeared to be affected by ice.
Special Computations.--	Discharge for the days when ice affected the gage height record was estimated on the basis of partial days of good record, good gage data before and after ice affected data, air temperature data collected at the gage, and two measurements at the gage during ice effect.
Remarks.--	Record good, except for the winter periods affected by ice, which are estimated and should be considered poor. Station maintained and record developed by Brian Leavesley.
Recommendations.--	Design a cover for the SE to reduce accumulation of moisture and icing on the tape wheel. Currently the existing cableway is a wooden "A" frame with a suspended cable and cable car. The cable car is a 2-person sit-down car with reel mount. For safety reasons the existing cableway should be removed and a new bank-operated cable way should be installed.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09357500 ANIMAS RIVER AT HOWARDSVILLE, CO

RATING TABLE.-- ANIHOWCO09 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

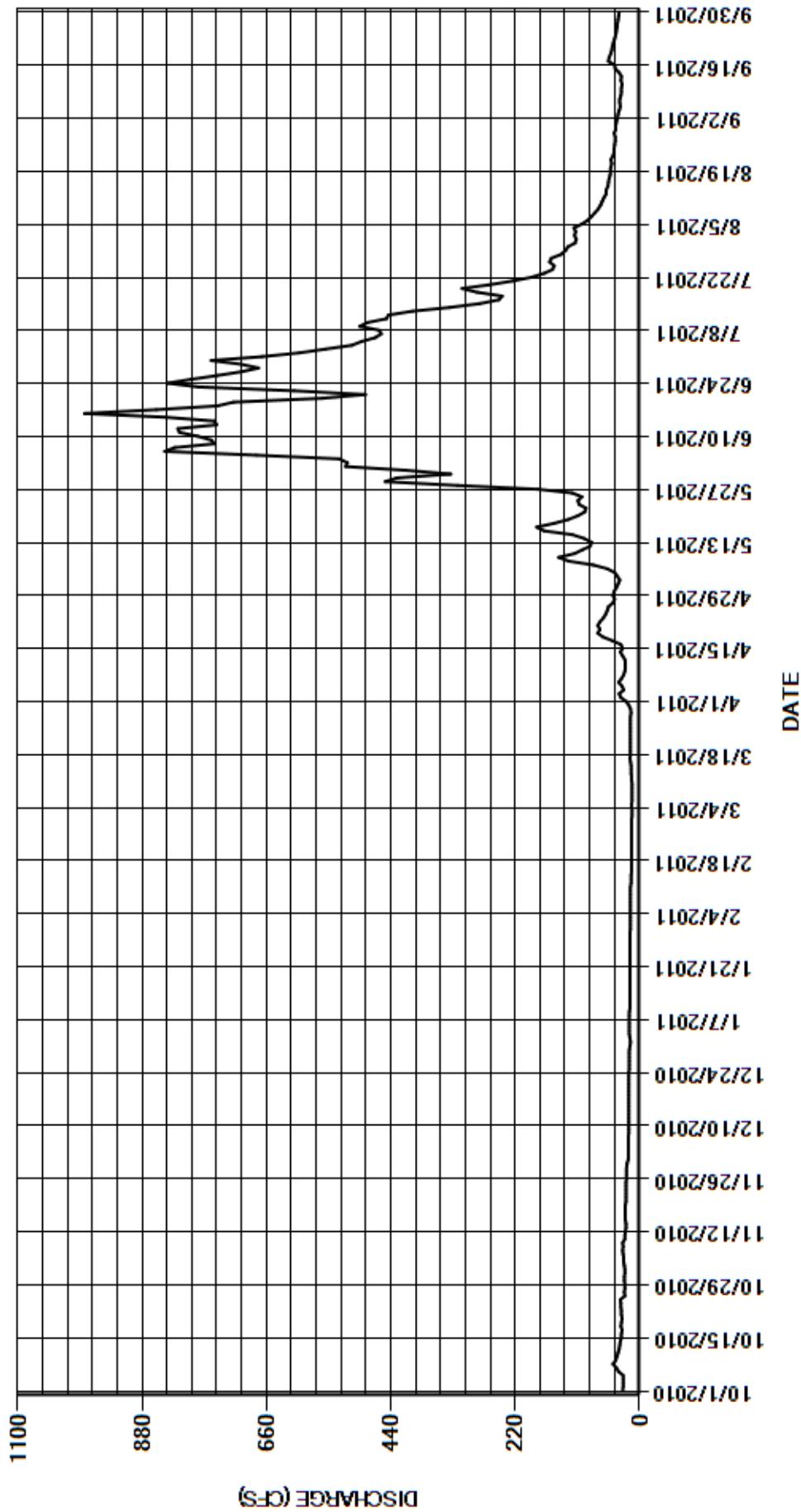
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	30	26	20	e16	e16	e14	24	41	414	668	112	41
2	29	26	20	e17	e16	13	33	38	520	602	115	39
3	29	27	20	e18	e16	13	36	35	517	556	113	38
4	29	28	20	e18	e16	14	28	39	531	509	116	36
5	29	28	20	e18	16	e14	31	44	678	492	102	34
6	37	29	20	e18	16	13	37	57	840	468	92	35
7	41	30	20	e18	16	13	32	82	822	457	85	35
8	47	29	e19	e18	16	13	28	125	752	461	79	33
9	42	30	19	e18	e16	e13	26	143	758	495	73	32
10	40	26	19	e17	e16	e13	25	115	782	482	69	32
11	38	26	19	e17	e16	e14	e25	101	814	448	66	31
12	36	25	19	e17	e15	e14	26	87	817	444	63	33
13	35	24	19	17	e15	15	30	85	748	402	59	32
14	34	24	19	17	15	15	34	98	752	336	59	36
15	32	25	19	17	e14	15	30	119	838	283	56	43
16	32	25	19	17	14	16	33	169	982	249	55	44
17	31	25	19	17	e14	17	48	182	855	243	54	55
18	33	25	19	17	14	16	65	151	747	287	52	54
19	32	25	19	17	14	16	74	126	718	314	51	51
20	31	24	19	e17	e14	16	70	109	562	265	51	49
21	32	e24	19	e17	e14	16	74	97	485	224	49	48
22	32	e24	19	e17	e14	16	70	95	611	190	51	46
23	33	e24	19	e17	e14	e16	64	107	780	169	47	44
24	33	e24	e19	e17	14	16	60	109	835	154	45	42
25	34	e24	e18	e17	14	16	57	102	794	151	45	41
26	26	e23	e18	e17	14	e16	55	119	748	159	44	40
27	27	e23	e18	e17	14	16	47	180	705	156	43	39
28	26	23	e18	e17	e14	16	44	322	674	139	43	38
29	26	23	e18	e17	---	15	47	450	705	131	45	37
30	27	e22	e18	e17	---	16	45	429	758	127	42	36
31	27	---	e17	16	---	19	---	334	---	114	42	---
TOTAL	1010	761	588	532	417	465	1298	4290	21542	10175	2018	1194
MEAN	32.6	25.4	19.0	17.2	14.9	15.0	43.3	138	718	328	65.1	39.8
AC-FT	2000	1510	1170	1060	827	922	2570	8510	42730	20180	4000	2370
MAX	47	30	20	18	16	19	74	450	982	668	116	55
MIN	26	22	17	16	14	13	24	35	414	114	42	31
CAL YR	2010	TOTAL	31949	MEAN	87.5	MAX	917	MIN	12	AC-FT	63370	
WTR YR	2011	TOTAL	44290	MEAN	121	MAX	982	MIN	13	AC-FT	87850	

MAX DISCH: 1290 CFS AT 21:45 ON JUN 16,2011 GH 3.66 FT SHIFT 0.1 FT

MAX GH: 3.66 FT AT 21:45 ON JUN 16,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09357500 ANIMAS RIVER AT HOWARDSVILLE, CO
WY2011 HYDROGRAPH



SAN JUAN RIVER BASIN
LA PLATA AND CHERRY CREEK DITCH NEAR HESPERUS
Water Year 2011

Location.--	Lat. 37°19'26", Long. 108°03'41", in SE 1/4 NW 1/4 sec. 3, T.35 N., R.11 W., NMPM, La Plata County, hydrologic unit 14080105, on the right bank approximately 1.1 miles downstream of the headgate and 2.5 miles north of the town of Hesperus, CO.
Drainage Area and Period of Record.--	Drainage Area - NA. Diversion record 1948 to present. Published streamflow record Oct. 1, 1993 to present.
Equipment.--	Sutron Satlink 2 DCP with a shaft encoder in a wood shelter and 22" x 22" concrete well. Primary reference gage is a staff gage located on the inside of the stilling well. Control is a 5-foot concrete Parshall flume. No changes this year.
Hydrologic Conditions.--	The ditch above and below the control is sand, gravel, cobble and sparse small boulders with a very well defined stilling pool. The stilling pool fills with sand and gravel causing the approach velocity to increase. The approach conditions into the flume are good. Vegetative growth downstream of the flume rarely causes submergence but beavers have been known to build dams downstream of the flume.
Gage-Height Record.--	The primary record is 15-minute shaft encoder data downloaded from satellite telemetry with DCP download data for backup purposes. The gage was visited on 23 separate occasions this water year to verify the shaft encoder remained calibrated to the primary reference. Two adjustments were made to the shaft encoder. One on June 13, 2011 (-0.02 ft correction) and one on July 11, 2011 (+0.01 ft. correction). Satellite telemetry data is complete except for 0730 on September 14, 2011 to 1115 on September 18, 2011. DCP did not transmit during this period because the GPS antenna was broke. Data downloaded from the DCP was used to fill in missing data. Record is complete and reliable.
Datum Corrections.--	Levels were not run this water year. Levels were last run on August 22, 2008 to the inside staff gage. The staff gage was found to be reading 0.006-ft high. No corrections were made as the staff gage was found to be within allowable tolerances.
Rating.--	The control is a standard 5-foot concrete Parshall flume. Rating No. 01, in use since the gage was installed, was used until December 31, 2010. Rating No. 02 began on January 1, 2011 and was used the remaining part of the water year. Rating No. 2 defines the control with gravel in the stilling pool above the Parshall flume. The intake to the stilling well is 0.04 ft. above the floor of the flume. Flows below a gage height of 0.04 ft. are assumed to be negligible and a 0 flow is assigned to them. Six discharge measurements (Nos. 41-46) were made this year, ranging in discharge from 4.47 cfs to 36.2 cfs. An observation of zero flow was made on April 29, 2011. Measurements and observation of zero flow cover the range-in-stage experienced except for higher average daily flows of June 23, 30 and July 1, 2011. The peak instantaneous flow of 42.2 cfs occurred at 2100 on June 29, 2011 at a gage height of 1.46 ft with a shift of +0.02 ft. It exceeded the stage of Measurement 44 made June 24, 2011 by 0.14 feet in stage.
Discharge.--	Shifting control method was used all water year. Shifts were applied by stage and time. The Parshall flume has a positive longitudinal slope (the throat is lower than the entrance of the converging section). The stilling pool above the flume has filled in with sand and gravel causing higher approach velocities. The positive longitudinal slope along with the excessive approach velocities cause the shifts to plot to the right of a standard rating (positive shifts). Variable shift curve LPCDITCOVS10A was used at the end of water year 2010 and continued until 2345 on December 31, 2010. Shifts were distributed by time, with a +0.02 ft. shift, from 0000 on January 1, 2011 until the end of the water year. Open-water measurements showed raw shifts varying between 0.00 and +0.06 feet. All measurements were given full weight except for Measurement Nos. 41, 43 and 46 which were discounted -3% to 4% to smooth shift distribution.
Special Computations.--	No special computations were necessary this water year
Remarks.--	Record is complete, reliable and good. Station maintained by Russell Crangle and Brian Boughton. Record developed by Brian Boughton.
Recommendations.--	None.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

LA PLATA AND CHERRY CREEK DITCH NEAR HESPERUS

RATING TABLE-- LPCDITCO01 USED FROM 01-OCT-2010 TO 31-DEC-2010
LPCDITCO02 USED FROM 01-JAN-2011 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.65	3.3	0.00	0.00	0.00	0.00	0.00	0.00	25	38	9.6	0.82
2	0.53	3.8	0.00	0.00	0.00	0.00	0.00	0.00	31	31	10	0.74
3	0.66	4.3	0.00	0.00	0.00	0.00	0.00	0.00	31	26	9.5	0.68
4	1.5	4.8	0.00	0.00	0.00	0.00	0.00	0.00	31	18	8.5	0.56
5	1.1	2.7	0.00	0.00	0.00	0.00	0.00	0.00	32	6.2	7.6	0.53
6	2.7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28	0.00	6.7	0.25
7	4.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24	0.00	5.8	0.00
8	4.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27	6.9	5.1	0.00
9	3.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28	20	4.4	0.00
10	3.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27	23	3.8	0.00
11	2.7	0.14	0.00	0.00	0.00	0.00	0.00	0.00	28	21	3.4	0.00
12	2.4	0.07	0.00	0.00	0.00	0.00	0.00	0.00	30	29	2.9	0.00
13	2.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29	25	2.5	0.00
14	1.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29	22	2.4	0.00
15	1.7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31	21	1.9	0.00
16	1.4	0.00	0.00	0.00	0.00	0.00	0.00	0.07	31	21	1.6	0.00
17	1.4	0.00	0.00	0.00	0.00	0.00	0.00	5.8	31	19	1.4	0.00
18	1.6	0.00	0.00	0.00	0.00	0.00	0.00	12	29	19	1.2	0.06
19	1.7	0.00	0.00	0.00	0.00	0.00	0.00	11	28	16	1.1	1.5
20	1.4	0.00	0.00	0.00	0.00	0.00	0.00	9.5	27	13	1.0	2.4
21	2.3	0.00	0.00	0.00	0.00	0.00	0.00	9.0	28	13	0.94	2.9
22	3.1	0.00	0.00	0.00	0.00	0.00	0.00	8.6	35	12	1.0	3.2
23	3.6	0.00	0.00	0.00	0.00	0.00	0.00	11	37	11	1.3	3.3
24	3.4	0.00	0.00	0.00	0.00	0.00	0.00	16	36	11	1.3	3.2
25	3.8	0.00	0.00	0.00	0.00	0.00	0.00	16	36	10	1.1	2.9
26	3.2	0.00	0.00	0.00	0.00	0.00	0.00	17	35	10	1.5	2.7
27	3.0	0.00	0.00	0.00	0.00	0.00	0.00	18	34	9.7	1.3	2.2
28	2.7	0.00	0.00	0.00	0.00	0.00	0.00	20	34	8.5	1.1	1.9
29	2.8	0.00	0.00	0.00	---	0.00	0.00	20	36	7.7	1.1	1.6
30	2.9	0.00	0.00	0.00	---	0.00	0.00	20	40	7.4	0.91	1.2
31	3.1	---	0.00	0.00	---	0.00	---	19	---	10	1.0	---
TOTAL	74.54	19.11	0.00	0.00	0.00	0.00	0.00	212.97	928	485.40	102.95	32.64
MEAN	2.40	0.64	0.000	0.000	0.000	0.000	0.000	6.87	30.9	15.7	3.32	1.09
AC-FT	148	38	0	0	0	0	0	422	1840	963	204	65
MAX	4.5	4.8	0.00	0.00	0.00	0.00	0.00	20	40	38	10	3.3
MIN	0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24	0.00	0.91	0.00

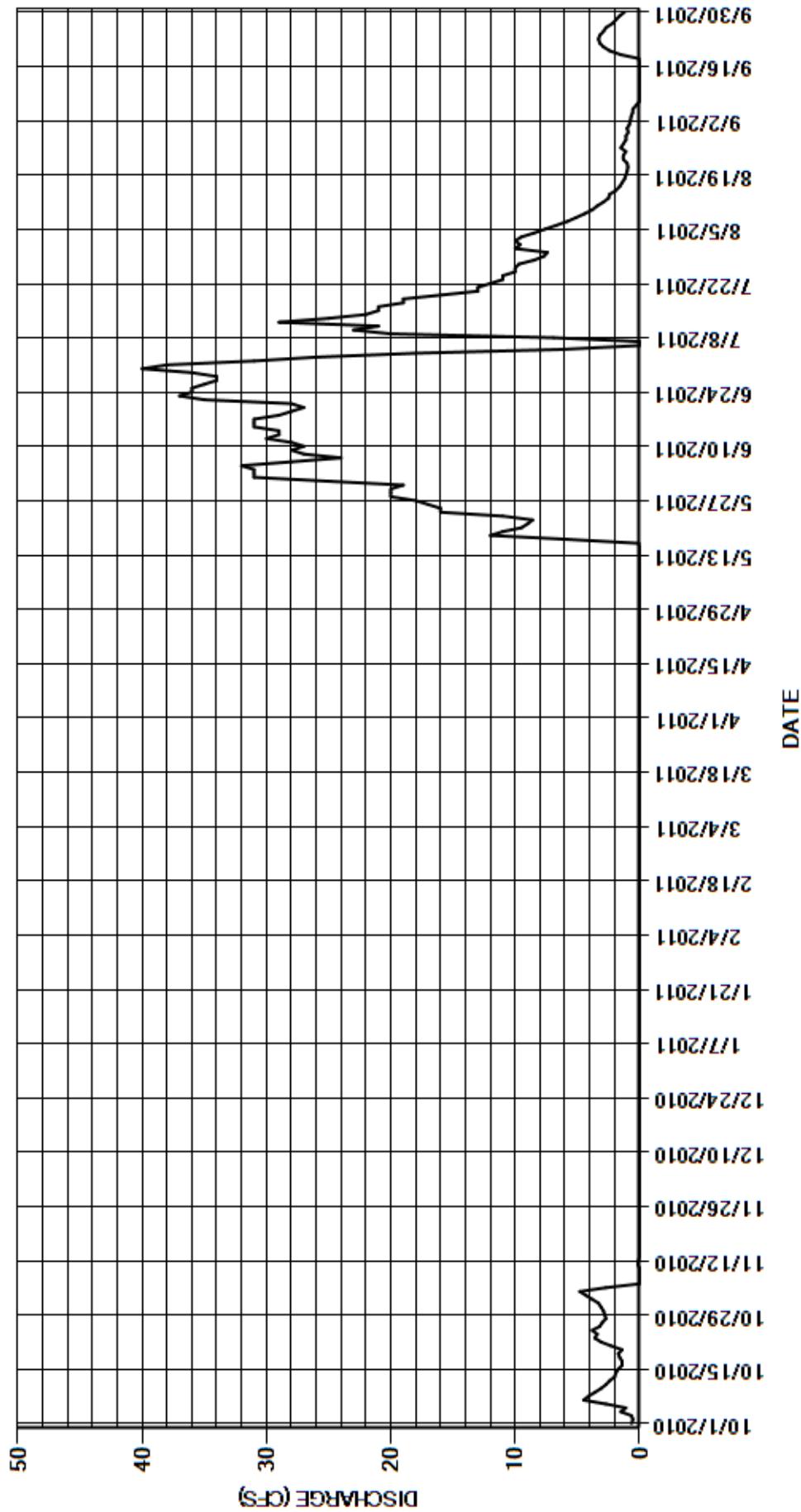
CAL YR	2010	TOTAL	1739.02	MEAN	4.76	MAX	38	MIN	0.00	AC-FT	3450
WTR YR	2011	TOTAL	1855.61	MEAN	5.08	MAX	40	MIN	0.00	AC-FT	3680

MAX DISCH: 42.2 CFS AT 21:00 ON JUN 29,2011 GH 1.46 FT SHIFT 0.02 FT

MAX GH: 1.46 FT AT 21:00 ON JUN 29,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LA PLATA AND CHERRY CREEK DITCH NEAR HESPERUS
WY2011 HYDROGRAPH



SAN JUAN RIVER BASIN
PINE RIDGE DITCH NEAR HESPERUS
Water Year 2011

Location.--	Lat. 37°17'31", Long. 108°02'07", in NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 14, T.35 N., R.11 W., NMPM, La Plata County, Hydrologic Unit 14030105, on the left bank approximately 0.9 miles below the head-gate and 0.3 miles north of the Town of Hesperus.
Drainage Area and Period of Record.--	Drainage Area - N/A. Diversion record Nov. 1, 1947 to present. Published streamflow record Oct. 1, 1993 to present.
Equipment.--	Sutron Satlink 2 DCP with a shaft encoder on a separate float in a 30-in diameter corrugated metal well and a 42-in diameter corrugated metal shelter. Primary reference gage is outside staff gage installed in flume (0.00-ft to 2.06-ft.). The control is a 3-foot steel Parshall flume with a depth of 2-ft. No other changes this year.
Hydrologic Conditions.--	The ditch above and below the control is silt and gravel with a very well defined stilling pool. The approach conditions into the flume are good. Vegetative growth downstream of the flume can cause submergence if the ditch is not maintained. On April 29, 2008 a 34 in x 50 in elliptical corrugated metal pipe was installed in the ditch approximately 200-ft below the gage. The culvert appears to be adequate and allows the flume to operate under free-flow conditions. The culvert was installed to access the Indian Shadows subdivision.
Gage-Height Record.--	The primary record is 15-minute shaft encoder data downloaded from satellite telemetry with the DCP log as backup. The gage was visited on 22 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted 2 times this water year (Mar. 29, 2011 and May 27, 2011). The adjustments made were +0.01 ft. and -0.02 ft. respectively. The adjustments were distributed by time to the last known correct readings. The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice on or below the control causing the flume to submerge. The flume was submerged on Nov. 28-30; Dec. 24, 27-30, 2010; Feb. 15, 18; Mar. 23, 2011.
Datum Corrections.--	Levels were not run this water year. Levels were last run on August 22, 2008.
Rating.--	The control is a standard, 3-foot, steel Parshall flume. Rating No. 01 in use since the gage was installed was used all water year. Rating No. 01 is a standard 3-ft Parshall flume rating above a gage height of 0.06-ft. At gage heights below 0.06-ft the well becomes isolated as the invert of the intake is 0.06-ft. above the floor of the flume at the staff gage. Flows below a gage height of 0.06-ft. are assumed to be negligible and a 0 discharge is assigned to them. Two discharge measurements Nos. 19 and 20 were made this year. They range in discharge from 2.98 to 9.64 cfs. Observations of zero flow were made on November 5, 2010 and July 1, 2011. Measurements and observation of zero flow cover the range-in-stage except for the higher daily flows of Mar. 23-30, 2011. The peak instantaneous flow of 11.3 cfs occurred at 1730 on March 22, 2011 at a gage height of 0.98 ft. with a shift of -0.02 ft. It exceeded the stage of Measurement No. 19, made March 29, 2011 by 0.09 ft. in stage. The peak instantaneous gage height at 0000 on November 29, 2010 was 1.78 ft. The gage height was affected by ice on and below the control submerging the flume.
Discharge.--	Shifts were applied as defined by measurements and were distributed by stage. Shift curve PINDITCOVS11A was applied throughout the entire period of record. Measurements are made at the staff gage and well intake, in the flume. All measurements made were given full weight.
Special Computations.--	Discharge for periods of ice-affected record was estimated on the basis of good record before and after ice, temperature data from LAPHESCO and partial days of good record. The gage hydrograph along with the hydrograph from the La Plata River at Hesperus (LAPHESCO) was used to determine periods of ice-affected record.
Remarks.--	Record is good, except for the period when the flume was affected by backwater from ice on and below the control. Record during these periods is estimated and should be considered poor. Station maintained by Jeff Titus, Russell Crangle and Brian Boughton. Record developed by Brian Boughton.
Recommendations.--	None.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

PINE RIDGE DITCH NEAR HESPERUS

RATING TABLE-- PINDITCO01 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

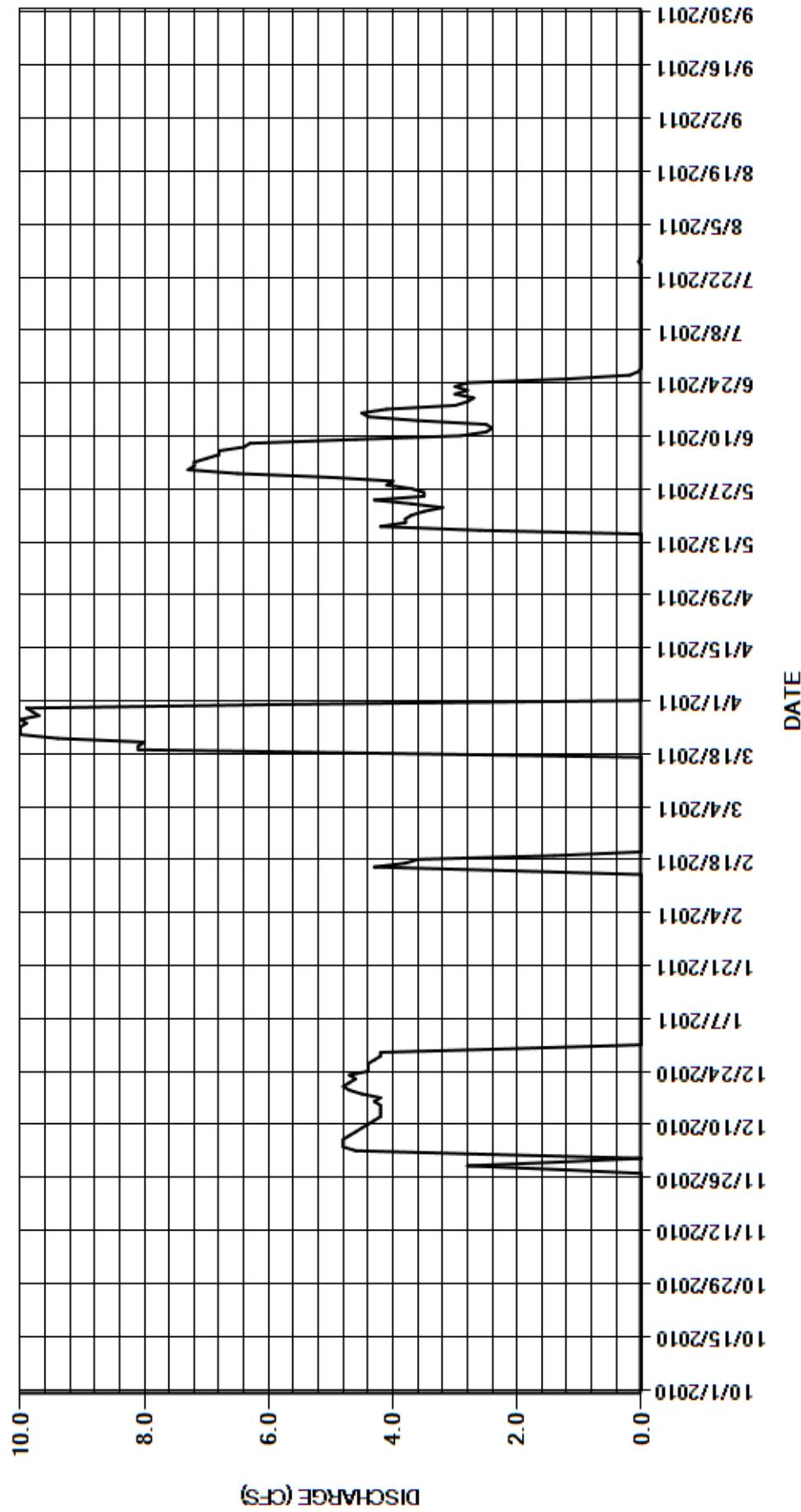
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.3	0.00	0.00	0.00
2	0.00	0.00	2.4	0.00	0.00	0.00	0.00	0.00	7.2	0.00	0.00	0.00
3	0.00	0.00	4.6	0.00	0.00	0.00	0.00	0.00	7.2	0.00	0.00	0.00
4	0.00	0.00	4.8	0.00	0.00	0.00	0.00	0.00	7.0	0.00	0.00	0.00
5	0.00	0.00	4.8	0.00	0.00	0.00	0.00	0.00	6.8	0.00	0.00	0.00
6	0.00	0.00	4.8	0.00	0.00	0.00	0.00	0.00	6.8	0.00	0.00	0.00
7	0.00	0.00	4.7	0.00	0.00	0.00	0.00	0.00	6.4	0.00	0.00	0.00
8	0.00	0.00	4.6	0.00	0.00	0.00	0.00	0.00	6.3	0.00	0.00	0.00
9	0.00	0.00	4.5	0.00	0.00	0.00	0.00	0.00	4.6	0.00	0.00	0.00
10	0.00	0.00	4.4	0.00	0.00	0.00	0.00	0.00	2.9	0.00	0.00	0.00
11	0.00	0.00	4.3	0.00	0.00	0.00	0.00	0.00	2.5	0.00	0.00	0.00
12	0.00	0.00	4.2	0.00	0.00	0.00	0.00	0.00	2.4	0.00	0.00	0.00
13	0.00	0.00	4.2	0.00	0.00	0.00	0.00	0.00	2.5	0.00	0.00	0.00
14	0.00	0.00	4.2	0.00	0.00	0.00	0.00	0.00	3.6	0.00	0.00	0.00
15	0.00	0.00	4.2	0.00	e2.1	0.00	0.00	0.00	4.4	0.00	0.00	0.00
16	0.00	0.00	4.3	0.00	4.3	0.00	0.00	0.00	4.5	0.00	0.00	0.00
17	0.00	0.00	4.2	0.00	3.8	0.00	0.00	4.2	4.1	0.00	0.00	0.00
18	0.00	0.00	4.5	0.00	e3.6	4.0	0.00	3.8	3.0	0.00	0.00	0.00
19	0.00	0.00	4.7	0.00	1.4	8.1	0.00	3.8	2.8	0.00	0.00	0.00
20	0.00	0.00	4.8	0.00	0.00	8.1	0.00	3.7	2.7	0.00	0.00	0.00
21	0.00	0.00	4.7	0.00	0.00	8.0	0.00	3.5	3.0	0.00	0.00	0.00
22	0.00	0.00	4.6	0.00	0.00	9.4	0.00	3.2	2.8	0.00	0.00	0.00
23	0.00	0.00	4.7	0.00	0.00	e10	0.00	3.7	3.0	0.00	0.00	0.00
24	0.00	0.00	e4.4	0.00	0.00	10	0.00	4.3	2.8	0.00	0.00	0.00
25	0.00	0.00	4.4	0.00	0.00	10	0.00	3.5	1.2	0.00	0.00	0.00
26	0.00	0.00	4.4	0.00	0.00	9.9	0.00	3.5	0.19	0.04	0.00	0.00
27	0.00	0.00	e4.3	0.00	0.00	10	0.00	3.7	0.04	0.01	0.00	0.00
28	0.00	e1.3	e4.2	0.00	0.00	9.7	0.00	4.1	0.00	0.00	0.00	0.00
29	0.00	e2.8	e4.2	0.00	---	9.8	0.00	4.0	0.00	0.00	0.00	0.00
30	0.00	e1.3	e2.0	0.00	---	9.9	0.00	5.0	0.00	0.00	0.00	0.00
31	0.00	---	0.00	0.00	---	5.6	---	6.5	---	0.00	0.00	---
TOTAL	0.00	5.40	125.10	0.00	15.20	122.50	0.00	63.10	108.03	0.05	0.00	0.00
MEAN	0.000	0.18	4.04	0.000	0.54	3.95	0.000	2.04	3.60	0.002	0.000	0.000
AC-FT	0	11	248	0	30	243	0	125	214	0.1	0	0
MAX	0.00	2.8	4.8	0.00	4.3	10	0.00	6.5	7.3	0.04	0.00	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAL YR	2010	TOTAL	446.44	MEAN	1.22	MAX	11	MIN	0.00	AC-FT	886	
WTR YR	2011	TOTAL	439.38	MEAN	1.20	MAX	10	MIN	0.00	AC-FT	872	

MAX DISCH: 11.3 CFS AT 17:30 ON MAR 22,2011 GH 0.98 FT SHIFT -0.02 FT

MAX GH: 1.78 FT AT 00:00 ON NOV 29,2010 (Backwater from ice)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PINE RIDGE DITCH NEAR HESPERUS
WY2011 HYDROGRAPH



SAN JUAN RIVER BASIN
09365500 LA PLATA RIVER AT HESPERUS
Water Year 2011

Location.--	Lat. 37°17'23", Long. 108°02'24", in NE 1/4 SW 1/4 sec. 14, T.35 N., R.11 W., NMPM La Plata County, Hydrologic Unit 14080105, on right bank at Hesperus 700 ft downstream from U.S. Highway 160.
Drainage Area and Period of Record.--	37 mi ² , approximately. Periodic data June 1904 to Nov. 1910. Continuous from June 1917 to current year, with some periods of monthly data only.
Equipment.--	Graphic water-stage recorder and a Sutron Satlink 2 HDR DCP with a shaft encoder on a separate float in a 64-inch x 64-inch concrete block shelter and a 42-inch diameter corrugated metal well. The primary reference gage is an electric drop tape inside the gage house. The station is also equipped with a Sutron air temperature sensor and an electric float tank heater which is used to keep the well from freezing in the winter. Control is man-made concrete ramp flume located approximately 15 feet downstream. A steel foot bridge is located 60 feet below the gage house. No changes this year.
Hydrologic Conditions.--	Drainage area above the gage is 37 square miles. The basin begins in high mountain terrain above 11,000 feet and drops to 8,100 feet at the gage from USGS topographic maps. The basin mainly consists of rock and forested mountains above the gage and changes to agricultural lands of moderate slope terrain below the gage. Small cobbles and gravel are deposited in the stilling pool above the control during low flow and scour during moderate to high flow events. The La Plata and Cherry Creek Ditch and the Pine Ridge Ditch export water above the gage for irrigation of approximately 3,000 acres.
Gage-Height Record.--	The primary record is 15-minute shaft encoder data from satellite telemetry with DCP download data and graphic chart record for backup purposes. The gage was visited on 33 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted on 2 separate occasions (Feb. 15, 2011 with +0.01 ft correction and May 31, 2011 with -0.02 ft correction). The record was corrected by prorating by time to the last known matched reading. Two flush corrections were made this water year. The flush corrections occurred on Jun. 8, 2011 (-0.11 ft.) and Jun. 17, 2011 (-0.04 ft.). The flush corrections were prorated by time within the final record back to time previous inflection point on the hydrograph. The record is complete and reliable, except for the following days when the stage-discharge relationship was affected by ice on the control and the inlets were partially plugged with silt. Ice on the control ("b" days): Nov. 23, 25-27, 29, 30; Dec. 1, 27-31, 2010; Jan. 1-8, 10-13, 15, 16, 20-30; Feb. 1-13, 21-23, 28; Mar. 1, 5, 2011. Partially plugged inlets: Jun. 6-8, 16-17, 2011.
Datum Corrections.--	Levels were not run this water year. Levels were last run on Oct. 14, 2009 using RM No. 1 as base. The gage was found to be reading within the allowable error tolerances.
Rating.--	The control at medium and high flows is a long throated flume, hereafter referred to as a "Ramp Flume" that was constructed in August of 2000 to act as the control section for the gage. Low flows are controlled by the cobble, gravel and silt between the ramp flume and inlets. The ramp flume is located about 15 feet below the inlets to the gage. A concrete ledge with an eight-inch "I" beam, located about 60 feet below the station, acts as a limit for scour but does not act as a control section. A large boulder weir was constructed on Mar. 16-17, 2009 between the "I" beam and ramp flume to further limit scour below the ramp flume. The boulder weir has no impact on the rating of the ramp flume. Flows are contained within a single channel up to a gage height of 5.8 feet. Flows above a gage height of 5.8 feet will overbank on the right side only. The left bank is contained by the small mesa that is over 15-feet above the flow line of the channel. Rating No. 38 in use since Oct. 1, 2008 was used the entire water year. The rating is well-defined to 560 cfs. Nineteen discharge measurements (Nos. 1464-1481) were made this year, ranging in discharge from 4.98 to 200 cfs. They cover the range in stage experienced except for the lower daily flows of Feb. 16-18, 2011 and the higher daily flow of May 29, 30; Jun. 2-11, 2011. The peak instantaneous flow is unknown because the recorded gage height was affected by partially plugged intakes. The maximum mean daily flow was 295 cfs on June 7, 2011. The peak instantaneous gage height occurred at 0845 on Jan. 28, 2011 was caused by backwater from ice on the control.
Discharge.--	Shifting control method was used for the entire water year. Shifts were applied as defined by measurements and were distributed by stage. Shifts were distributed by stage using the variable shift curve LAPHECOVS11A for the entire water year. Open-water measurements showed shifts varying between -0.01 and +0.03 feet. Shifts were applied directly and given full weight except measurement Nos. 1472, 1473, 1475, 1476, 1480 and 1481 which were discounted from -2% to +5% to smooth shift distribution.
Special Computations.--	Discharge for periods of ice-affected record was estimated on the basis of good record before and after ice, temperature records and partial days of good record. The gage hydrograph along with the hydrograph from the Pine Ditch was used to determine periods of ice-affected record
Remarks.--	Record good, except for periods when ice affected the stage-discharge relationship and when the intake was partially plugged. Record during these periods should be considered poor. The peak instantaneous flow is unknown since it occurred when the intakes were partially plugged. Station maintained by Russell Crangle and Brian Boughton. Record developed by Brian Boughton.
Recommendations.--	Currently, the top of the sill of the shelter door is at a gage height of 5.80 ft. Although high flow events above a gage height of 5.80 ft are rare, they occur, and may warrant the installation of a crest gage. The large boulder weir that was installed stabilized the control but made the high water measurement section poor. A bank operated cableway may need to be installed in the weir pool above the gage to provide more reliable high water measurements.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09365500 LA PLATA RIVER AT HESPERUS

RATING TABLE-- LAPHESCO38 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

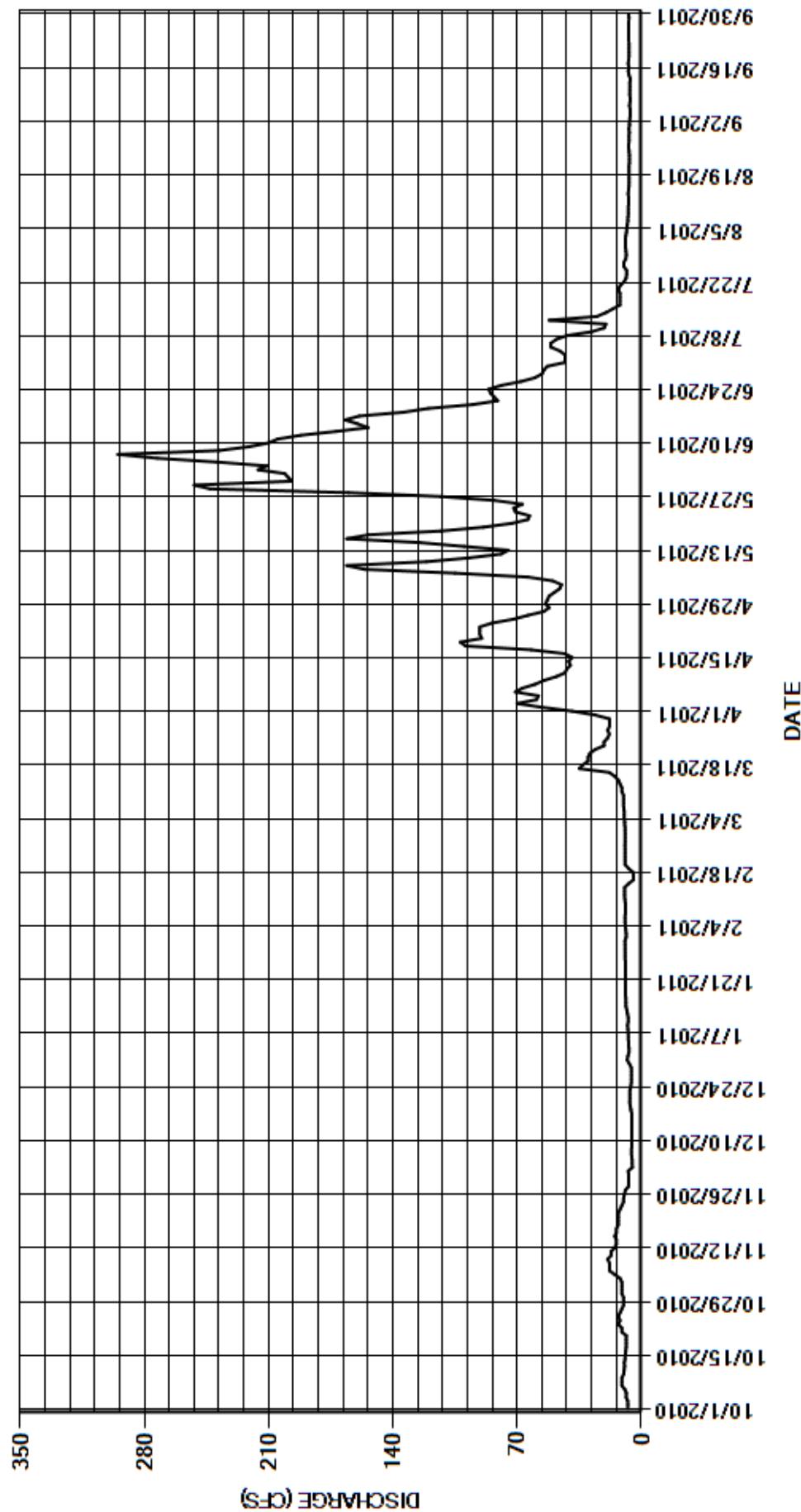
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.6	11	e7.2	e7.6	e8.6	e9.2	39	52	199	43	9.1	6.7
2	7.6	11	7.4	e7.0	e8.6	9.3	56	49	201	43	9.0	6.6
3	7.7	11	5.0	e7.0	e8.8	9.4	70	46	216	43	8.8	6.4
4	8.6	12	5.2	e7.2	e9.0	9.7	59	45	211	46	8.4	6.3
5	8.4	15	5.2	e7.3	e9.2	e9.7	58	50	239	51	8.2	6.3
6	9.3	18	5.5	e7.3	e9.2	9.7	71	64	273	51	7.9	6.7
7	11	18	5.5	e7.4	e9.1	10	67	105	295	48	7.6	6.4
8	11	18	5.5	e7.6	e9.0	10	60	156	238	42	7.5	6.3
9	11	19	5.4	7.8	e9.0	10	55	166	221	28	7.3	6.6
10	10	17	5.5	e7.4	e9.1	10	48	121	210	21	7.3	6.5
11	9.7	17	5.4	e7.4	e9.3	11	43	97	205	20	7.3	6.4
12	9.5	15	5.4	e7.8	e9.5	11	42	79	192	52	7.2	6.5
13	9.6	14	5.4	e8.2	e9.5	12	40	75	172	25	7.1	6.2
14	9.2	14	5.4	8.7	9.5	13	41	100	154	20	7.5	7.0
15	9.0	15	5.4	e8.7	7.2	15	39	125	160	16	7.2	7.4
16	8.8	14	5.5	e8.8	4.4	18	43	166	167	12	7.0	7.0
17	8.6	14	5.4	8.9	4.4	35	62	154	159	12	6.9	7.5
18	8.5	13	5.9	8.9	4.8	33	99	113	134	12	6.9	7.1
19	8.6	13	6.3	8.9	7.3	30	102	89	120	12	7.0	7.0
20	8.4	13	6.6	e8.9	9.2	30	90	73	95	13	7.0	7.0
21	11	13	6.4	e8.9	e9.2	29	91	64	81	12	7.0	7.0
22	11	12	6.4	e8.9	e9.2	26	91	63	83	9.8	6.8	7.0
23	13	e11	6.5	e9.0	e9.2	21	91	71	85	8.6	6.8	7.1
24	12	10	6.0	e9.0	9.2	21	84	72	86	8.3	6.8	7.1
25	13	e10	5.7	e9.0	9.3	19	72	67	79	8.3	6.9	7.1
26	12	e9.5	5.7	e9.1	9.1	18	64	83	68	9.8	7.2	7.2
27	11	e9.0	e5.7	e9.1	9.1	19	55	113	60	10	7.1	7.1
28	10	7.2	e5.7	e9.1	e9.1	18	52	165	56	8.8	6.9	7.1
29	10	e7.2	e5.7	e9.2	---	18	54	243	55	8.5	7.0	7.0
30	10	e7.2	e6.8	e9.2	---	18	53	252	53	8.7	6.8	7.2
31	11	---	e8.0	9.3	---	26	---	197	---	8.9	7.0	---
TOTAL	306.1	388.1	182.7	258.6	238.1	538.0	1891	3315	4567	711.7	228.5	204.8
MEAN	9.87	12.9	5.89	8.34	8.50	17.4	63.0	107	152	23.0	7.37	6.83
AC-FT	607	770	362	513	472	1070	3750	6580	9060	1410	453	406
MAX	13	19	8.0	9.3	9.5	35	102	252	295	52	9.1	7.5
MIN	7.6	7.2	5.0	7.0	4.4	9.2	39	45	53	8.3	6.8	6.2
CAL YR	2010	TOTAL	11740.1	MEAN	32.2	MAX	247	MIN	4.1	AC-FT	23290	
WTR YR	2011	TOTAL	12829.6	MEAN	35.1	MAX	295	MIN	4.4	AC-FT	25450	

MAX DISCH: (N/A--due to partially plugged intakes)

MAX GH: 4.89 FT AT 08:45 ON JAN 28,2011 (Backwater from ice)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09365500 LA PLATA RIVER AT HESPERUS
WY2011 HYDROGRAPH



SAN JUAN RIVER BASIN
CHERRY CREEK AT THE MOUTH NEAR RED MESA
Water Year 2011

Location.--	Lat. 37°07'03", Long. 108°11'55.32" NAD 83, in NW¼ SW½ sec. 7, T.33 N., R.12 W., NMPM, La Plata County, Hydrologic Unit 14080105. Approximately 740-ft upstream of the confluence with the LaPlata River.
Drainage Area and Period of Record.--	75.3 mi ² . Colorado Divison of Water Resources published record October 1988 to present.
Equipment.--	Graphic water stage-recorder and a Sutron Satlink 2 DCP with a shaft encoder on a separate float in a 42-in corrugated metal well in a concrete block shelter. The primary reference gage is a steel drop tape referenced to a nonadjustable reference point (RP) on the wooden instrument shelf.
Hydrologic Conditions.--	The channel bottom is composed of cobble and gravel. Dense willows line the channel banks. At higher flows the dense willows impact the stage discharge relationship. The creek is ephemeral and only flows during the spring snow melt, significant rain storms and irrigation returns from La Plata and Cherry Creek Ditch.
Gage-Height Record.--	The primary record is 15-minute shaft encoder data from satellite telemetry with DCP download data and graphic chart record for backup purposes. Missing telemetry data was filled with download data from 1330 on October 13, 2010 to 1430 on October 13, 2010 and 2030 on August 14, 2011 to 0715 on August 15, 2011. The gage was visited on 27 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted (+0.02 ft.) on March 17, 2011 to match the primary reference. Shaft encoder corrections were prorated by time back to the last site visit when the readings matched. Two flush corrections (Oct. 13, 2010 and Mar. 17, 2011) were not applied in the record as they were minimal (0.01 ft.). The record is complete and reliable, except for the following days when the stage-discharge relationship was affected by ice and the floats were frozen in the well. Ice on the control: Nov. 12-19, Nov. 22-30; Dec. 1-14, 27-31, 2010; Jan. 1-5, 26-31, Feb. 1, 5-28; Mar. 1-8, 2011. Floats frozen in the well: Jan. 6-25, Feb. 2-4, Mar. 9-10, 2011.
Datum Corrections.--	Levels have never been run at this gage. No levels were run this year.
Rating.--	The control at low flows is a natural cobble riffle located 5-ft. below the gage. Dense willows along the right and left bank control at high flow. Willow growth causes the shifts to vary at high flows. Sand, silt fill and scour cause shifts as well. Rating No. 3A, dated Oct. 1, 2006, was used until Oct. 13, 2010. Rating No. 4 began on Oct. 13, 2010 and was used the remaining part of the water year. Rating no. 4 is fairly well defined from 0 to 55 cfs. Eleven measurements (Nos. 89-99) were made during the current water year ranging in discharge from 0.96 to 26.7 cfs. Two observation of zero flow were made this water year on August 29 and September 9, 2011. Observations of zero flow and the measurements cover the range in stage experienced except for the higher range in stage experienced on Apr. 19, 20, 2011. The peak instantaneous flow of 29.4 cfs occurred at 1815 on April, 19, 2011 at a gage height of 2.31 with a shift of 0.00 ft. It exceeded the stage of Measurement No. 93, made April 20, 2011 by 0.12 ft. in stage.
Discharge.--	Shifting control method was used for the entire water year. Shifting is caused by willows, trash, leaf debris and the movement of sediment. Shifts were applied as defined by measurements and were distributed by time and stage. Variable shift curve (CHEREDVS10B) from the end of water year 2010 was continued until 1400 on Oct. 13, 2010. Starting at 1415 on Oct. 13, 2010 rating No. 4 was implemented and shifts were distributed by time until 2345 on Aug. 25, 2011. Discharge was assumed to be 0 on Aug. 26 and was verified on Aug. 29. Open-water measurements showed shifts varying between -0.04 and +0.03 feet. Shifts were applied directly and given full weight except Measurement Nos. 91, 92, 93, 94, 95, 97, 98 and 99 which were discounted by -6% and 6% to smooth shift distribution.
Special Computations.--	The administrative record for the La Plata River below Cherry Creek was compared to the flows at the Cherry Creek gage. The control at the La Plata River gage is a concrete ramp flume that was installed in 2002. The gage provides a stable control. It is located approximately 1,200 ft. below the confluence of Cherry Creek and the La Plata River. The comparison of the two hydrographs was favorable. Discharge for periods of ice-affected record was estimated on the basis of good record before and after ice, temperature record at the La Plata River at Colorado/New Mexico State line gage and partial days of good record.
Remarks.--	Record from Oct. 1, 2010 to Nov. 11, 2010 is considered fair. Record from Nov. 12, 2010 to Mar. 10, 2011 is considered poor. Record from Mar. 11, 2011 to Aug. 28, 2011 is considered fair. Record from Aug. 29, 2011 to Sep. 30, 2011 is considered excellent. Station maintained by Russell Crangle and Brian Boughton and record developed by Brian Boughton.
Recommendations.--	Levels need to be run and benchmarks should be established in Water Year 2012.

STATE OF COLORADO
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OFFICE OF STATE ENGINEER

CHERRY CREEK AT THE MOUTH NEAR RED MESA

RATING TABLE-- CHEREDCO03A USED FROM 01-OCT-2010 TO 13-OCT-2010
CHEREDCO04 USED FROM 13-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

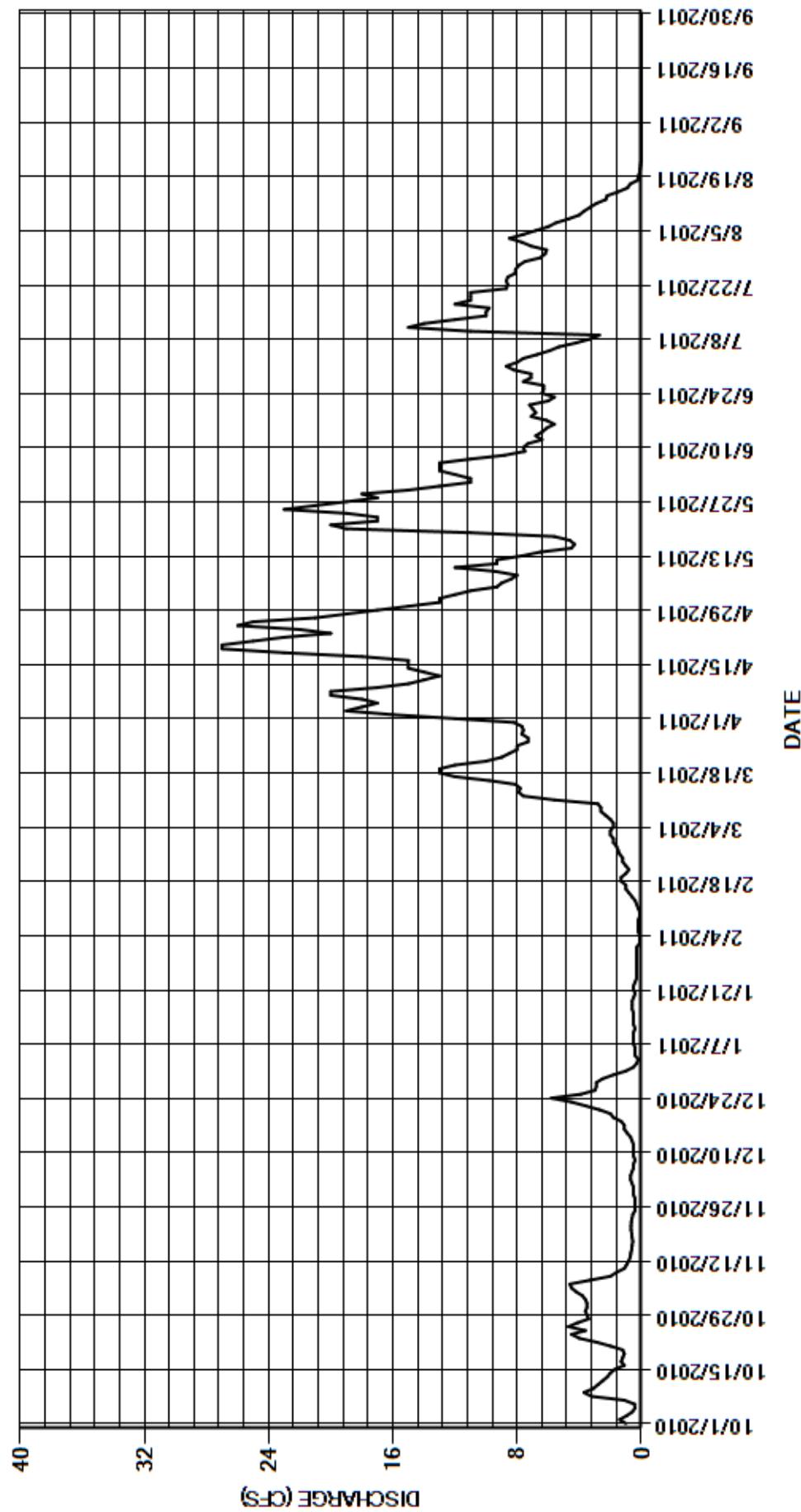
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.0	3.5	e0.50	e0.50	e0.30	e1.8	12	13	11	8.7	7.1	0.00
2	1.4	3.6	e0.60	e0.30	e0.10	e2.0	16	13	11	8.0	7.7	0.00
3	0.95	3.8	e0.70	e0.20	e0.10	e2.0	19	12	12	7.6	8.5	0.00
4	0.58	4.2	e0.70	e0.40	e0.10	e1.8	18	11	13	6.7	7.6	0.00
5	0.41	4.5	e0.60	e0.40	e0.20	e1.8	17	9.3	13	5.9	6.8	0.00
6	0.44	4.6	e0.50	e0.40	e0.20	e2.0	18	9.0	13	5.3	6.0	0.00
7	1.1	3.3	e0.50	e0.50	e0.20	e2.3	20	8.4	11	4.2	5.5	0.00
8	3.2	2.0	e0.40	e0.50	e0.20	e2.6	20	8.0	8.8	3.3	4.7	0.00
9	3.7	1.6	e0.50	e0.50	e0.10	e2.6	17	9.4	7.5	2.7	4.0	0.00
10	3.1	1.1	e0.50	e0.50	e0.10	e2.8	15	12	7.6	11	3.7	0.00
11	2.8	0.95	e0.50	e0.40	e0.20	5.6	14	9.3	7.3	15	3.3	0.00
12	2.5	e0.81	e0.50	e0.50	e0.30	7.6	13	9.3	6.4	14	2.9	0.00
13	2.2	e0.72	e0.60	e0.50	e0.40	7.9	14	7.7	6.8	12	2.3	0.00
14	2.0	e0.68	e0.70	e0.50	e0.60	7.8	15	6.5	6.4	10	2.2	0.00
15	1.7	e0.62	0.92	e0.50	e0.80	8.1	15	4.5	6.1	10	1.5	0.00
16	1.1	e0.60	1.1	e0.60	e1.0	9.8	15	4.3	5.6	9.8	0.90	0.00
17	1.3	e0.55	1.1	e0.60	e1.0	12	18	4.6	6.1	12	0.73	0.00
18	1.2	e0.60	1.3	e0.60	e1.3	13	23	5.6	7.1	11	0.23	0.00
19	1.1	e0.62	1.8	e0.50	e1.3	13	27	11	6.8	11	0.20	0.00
20	1.2	0.66	2.0	e0.40	e1.0	12	27	19	7.0	11	0.11	0.00
21	2.0	0.66	2.7	e0.50	e0.80	10	25	20	7.2	8.7	0.08	0.00
22	2.9	e0.65	3.6	e0.50	e1.0	9.0	23	17	6.0	8.6	0.04	0.00
23	4.0	e0.60	4.5	e0.40	e1.2	8.5	20	17	5.6	8.7	0.01	0.00
24	4.5	e0.55	5.8	e0.30	e1.2	8.0	22	19	6.4	8.6	0.01	0.00
25	3.6	e0.40	3.9	e0.30	e1.4	8.0	26	23	6.3	8.1	0.01	0.00
26	4.7	e0.40	3.0	e0.30	e1.5	7.3	25	21	6.3	8.1	0.00	0.00
27	4.1	e0.40	e2.9	e0.30	e1.6	7.3	21	19	7.6	7.9	0.00	0.00
28	3.4	e0.40	e2.9	e0.30	e1.8	7.7	19	17	7.1	7.5	0.00	0.00
29	3.5	e0.50	e2.5	e0.30	---	7.6	17	18	7.1	6.5	0.00	0.00
30	3.6	e0.50	e1.8	e0.30	---	7.7	15	15	8.2	6.2	0.00	0.00
31	3.5	---	e1.0	e0.30	---	8.2	---	13	---	6.1	0.00	---
TOTAL	72.78	44.07	50.62	13.10	20.00	207.8	566	385.9	241.3	264.2	76.12	0.00
MEAN	2.35	1.47	1.63	0.42	0.71	6.70	18.9	12.4	8.04	8.52	2.46	0.000
AC-FT	144	87	100	26	40	412	1120	765	479	524	151	0
MAX	4.7	4.6	5.8	0.60	1.8	13	27	23	13	15	8.5	0.00
MIN	0.41	0.40	0.40	0.20	0.10	1.8	12	4.3	5.6	2.7	0.00	0.00
CAL YR	2010	TOTAL	2799.45	MEAN	7.67	MAX	84	MIN	0.00	AC-FT	5550	
WTR YR	2011	TOTAL	1941.89	MEAN	5.32	MAX	27	MIN	0.00	AC-FT	3850	

MAX DISCH: 29.4 CFS AT 18:15 ON APR 19,2011 GH 2.31 FT SHIFT 0 FT

MAX GH: 2.31 FT AT 18:15 ON APR 19,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

CHERRY CREEK AT THE MOUTH NEAR RED MESA
WY2011 HYDROGRAPH



SAN JUAN RIVER BASIN
LONG HOLLOW AT THE MOUTH NEAR RED MESA
Water Year 2011

Location.--	Lat. 37°03'02", Long. 108°10'23", in SE 1/4 SW 1/4 sec. 32, T.33 N., R.12 W., NMPM, La Plata County.
Drainage Area and Period of Record.--	46.5 mi ² . Period of Record: October 1, 1988 to present
Equipment.--	Graphic water stage-recorder and Sutron Satlink 2 satellite monitoring DCP and shaft encoder on separate floats in a wooden shelter and well at a 4-foot steel Parshall flume. Primary reference gage is outside staff gage installed in flume. An insulated floor is installed in the stilling well when the temperatures fall below freezing. The floor was installed on Nov. 24, 2010 and removed on Mar. 17, 2011. No other changes.
Hydrologic Conditions.--	The drainage area above the gage is 46.5 square miles. The creek above and below the control is mainly silt with some sand and gravel. The approach conditions into the flume are poor. The stilling pool above the flume is poor. Excessive approach velocities tend to cause a positive shift to a standard Parshall flume rating. The creek base flow is from irrigation return flows and will flash during rain events.
Gage-Height Record.--	The primary record is 15-minute shaft encoder data downloaded from satellite telemetry with chart record used for backup purposes. The gage was visited on 25 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted five times this water year. Shaft encoder corrections were made on October 13, 2010 (-0.02 ft.), November 24, 2010 (-0.01 ft.), April 21, 2011 (+0.01 ft.), June 20, 2011 (-0.01 ft.) and September 30, 2011 (-0.02 ft.). The shaft encoder corrections were distributed by time to the last inspection when the shaft encoder matched the primary reference gage. Moss and silt were removed from the control on April 21, 2011 and September 30, 2011, resulting in corrections of -0.02 ft and -0.04 ft, respectively. The April correction was distributed by time as a flush correction. The September correction was distributed by time within the shift. Record is complete and reliable except for the following days when ice on the control affected the stage-discharge relationship: Jan 2-31, Feb. 1-12, 2011.
Datum Corrections.--	Levels were not run this year. Levels were last run on Mar. 2, 2009 using the floor of the flume at the staff gage as the base. Levels were used to determine if the converging section of the flume is level. Results indicate the flume is -0.07 ft. low on the intake side (right-edge-of-water). No other benchmarks were set at the time.
Rating.--	The control is a 4-foot Parshall flume installed in 1988 to monitor the return flows through Long Hollow for the Animas/La Plata Conservancy District. Horizontal dirt and grass wing walls extend in both directions above an elevation of 2.25 feet. Rating No. 1A, in use since October 1, 2007 and used for the entire water year, is a standard 4- foot Parshall flume rating from gage height 0 to 2.25 ft. Gage heights above 2.25 ft. flow in the natural channel. A theoretical rating was developed above a gage of 2.25 ft as no measurements have been made above this stage. The rating is well defined from 1.44 to 29 cfs. Two measurements were made during the current water year ranging in discharge from 2.02 to 3.49 cfs. They cover the range in stage experienced except for the lower average daily flows of Jun. 30; Jul. 1-8, 21-31; Aug. 1, 4-17, 27, 28; Sep. 7, 25-27, 2011 and the higher average daily flow of Oct. 1-31; Nov. 1-30; Dec. 1-31, 2010; Jan 1-31; Feb. 1-28; Mar. 1 -31; Apr. 1-30; May 1-31; Jun. 1-12, 2011. The peak instantaneous flow of 8.31 cfs occurred at 2345 Oct. 21, 2010 at a gage height of 0.60 ft and a shift of +0.06 ft. It exceeded the stage of Measurement No. 213, made Jun. 03, 2011 by 0.25 ft. in stage. The instantaneous peak gage height of 0.66 ft. occurred at 1330 Feb. 10, 2011 and was caused by backwater from ice on the control.
Discharge.--	Shifting control method was used during the entire water year. Shifting is mainly caused by moss growth in the flume and excessive silt in the approach section of the flume. Shifting is also caused by the unlevel Parshall flume. Measurements show shifts were +0.02 feet. Shifts were applied directly and given full weight except for Measurement Nos. 213 and 214 which were discounted -6% to -7% to smooth shift distribution. Shifts were distributed by stage utilizing shift curve LONREDCOVS11A as defined by Measurements 213 and 214 from 0000 Oct. 1, 2010 until 1445 Aug. 31, 2011. A shift correction occurred when moss and silt was removed from the Parshall flume on Sep. 30, 2011. Shifts were distributed by time from 1500 Aug. 31, 2011 (site visit noted the flume was clear) until 1300 Sep. 30, 2011 (Measurement No. 214) when moss and silt was removed from the Parshall flume. The shift before the flume was cleaned was -0.02 ft. (adjusted to -0.01) and changed to +0.02 ft. (adjusted to +0.03) after removal. The shift were distributed by time from 1315 Sep. 30, 2011 until 1400 Sep. 30, 2011, holding the +0.03 shift. Shifts were distributed by stage utilizing shift curve LONREDCOVS11A from 1415 Sep. 2011 until the end of the water year.
Special Computations.--	Discharge was estimated during periods of ice effect using trends in good record before and after ice affected periods and partial days of good record.
Remarks.--	Record is fair except for the periods of ice affect which are estimated and poor. Station maintained by Russell Crangle and Brian Boughton. Record developed by Brian Boughton.
Recommendations.--	Levels should be run in Water Year 2012.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

LONG HOLLOW AT THE MOUTH NEAR RED MESA

RATING TABLE-- LONREDCO01A USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

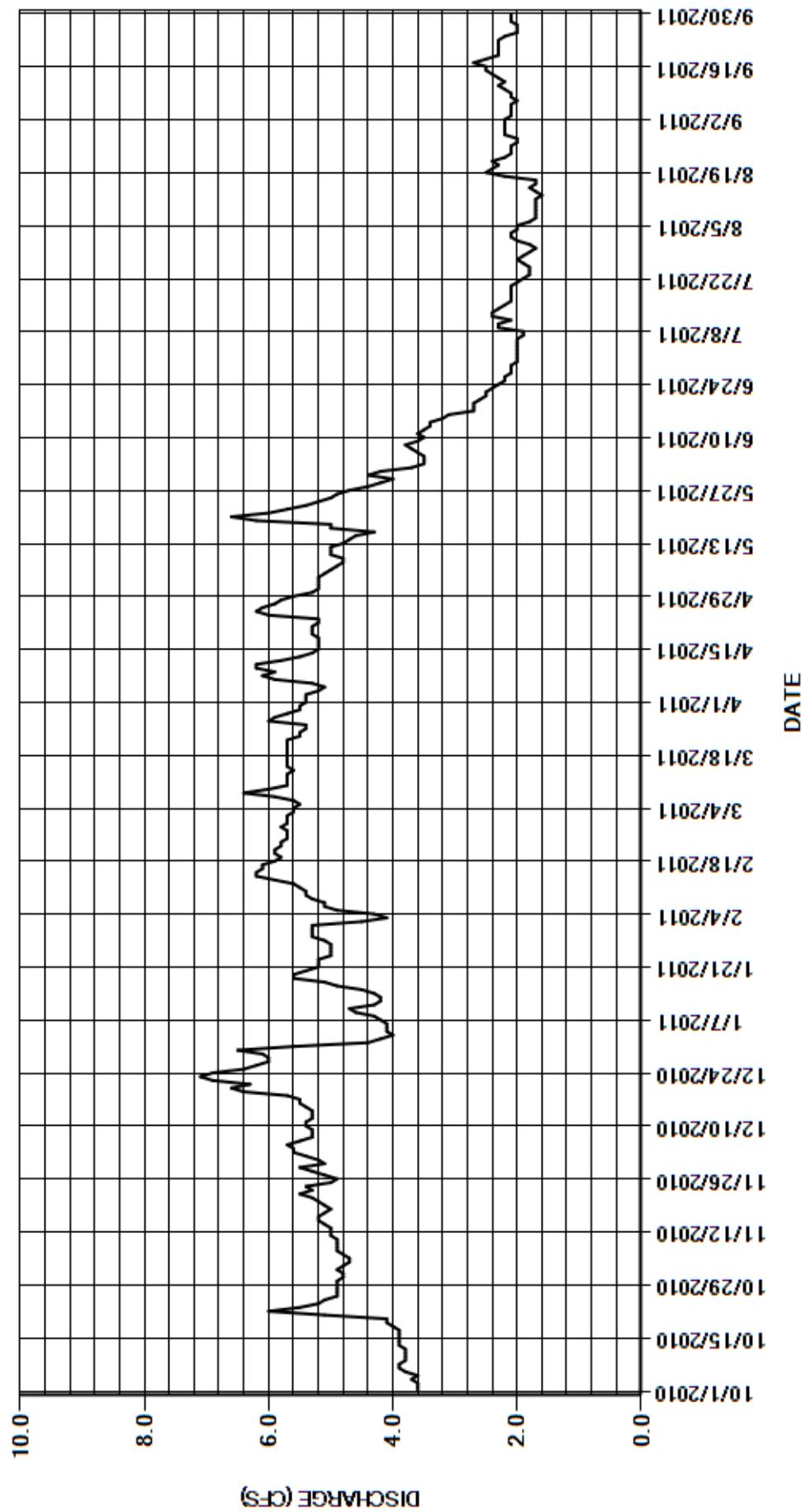
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.6	4.8	5.2	4.4	e5.3	5.7	5.4	5.2	4.2	2.0	2.0	2.2
2	3.6	4.9	5.4	e4.2	e4.5	5.7	5.4	5.2	3.7	2.0	2.1	2.2
3	3.6	4.8	5.6	e4.0	e4.1	5.6	5.4	5.2	3.5	2.0	2.1	2.1
4	3.7	4.7	5.6	e4.1	e4.3	5.6	5.2	5.2	3.5	2.0	2.0	2.1
5	3.6	4.7	5.7	e4.1	e4.9	5.5	5.1	5.1	3.5	2.0	2.0	2.1
6	3.8	4.8	5.5	e4.1	e5.1	5.6	5.3	5.0	3.6	2.0	1.8	2.1
7	3.9	4.9	5.3	e4.2	e5.1	5.9	5.9	4.9	3.7	1.9	1.7	2.0
8	3.9	4.9	5.3	e4.3	e5.3	6.4	6.1	4.8	3.8	1.9	1.7	2.1
9	3.8	4.9	5.3	e4.6	e5.4	6.0	5.9	4.8	3.6	2.3	1.7	2.1
10	3.8	4.9	5.4	e4.7	e5.4	5.7	6.2	5.0	3.5	2.3	1.7	2.2
11	3.8	5.0	5.4	e4.3	e5.5	5.7	6.2	5.0	3.6	2.1	1.7	2.3
12	3.8	5.0	5.3	e4.2	e5.6	5.7	5.8	5.0	3.5	2.4	1.7	2.2
13	3.9	5.0	5.3	e4.2	5.9	5.7	5.5	4.8	3.4	2.4	1.6	2.3
14	3.9	5.1	5.3	e4.3	6.2	5.6	5.3	4.7	3.4	2.3	1.7	2.4
15	3.9	5.2	5.4	e4.5	6.2	5.7	5.2	4.6	3.2	2.2	1.8	2.5
16	3.9	5.2	5.5	e4.9	6.1	5.7	5.2	4.3	3.1	2.1	1.7	2.5
17	3.9	5.1	5.5	e5.1	6.1	5.7	5.2	5.0	2.7	2.1	1.7	2.7
18	4.0	5.0	5.7	e5.6	5.9	5.7	5.2	5.0	2.7	2.1	2.2	2.5
19	4.1	5.1	6.4	e5.6	5.8	5.7	5.3	6.2	2.7	2.1	2.5	2.3
20	4.1	5.2	6.6	e5.4	5.9	5.7	5.3	6.6	2.6	2.1	2.4	2.3
21	5.1	5.3	6.3	e5.2	5.9	5.7	5.3	6.0	2.5	2.0	2.3	2.3
22	6.0	5.5	6.9	e5.2	5.8	5.7	5.2	5.7	2.5	1.9	2.4	2.3
23	5.5	5.3	7.1	e5.2	5.8	5.5	5.2	5.4	2.4	1.8	2.2	2.3
24	5.2	5.4	6.9	e5.0	5.7	5.5	6.0	5.2	2.3	1.8	2.1	2.2
25	5.1	5.0	6.4	e5.0	5.7	5.4	6.2	5.0	2.2	1.8	2.1	2.0
26	4.9	4.9	6.2	e5.0	5.7	5.4	6.1	4.9	2.2	1.9	2.1	2.0
27	4.9	5.1	6.0	e5.0	5.8	6.0	5.9	4.7	2.1	2.0	2.0	2.0
28	4.9	5.3	6.0	e5.1	5.7	5.9	5.8	4.4	2.1	1.9	2.0	2.1
29	4.9	5.5	6.1	e5.3	---	5.7	5.6	4.2	2.1	1.8	2.2	2.1
30	4.9	5.1	6.5	e5.3	---	5.5	5.3	4.0	2.0	1.7	2.2	2.1
31	4.8	---	5.6	e5.3	---	5.5	---	4.4	---	1.8	2.2	---
TOTAL	132.8	151.6	180.7	147.4	154.7	176.4	166.7	155.5	89.9	62.7	61.6	66.6
MEAN	4.28	5.05	5.83	4.75	5.52	5.69	5.56	5.02	3.00	2.02	1.99	2.22
AC-FT	263	301	358	292	307	350	331	308	178	124	122	132
MAX	6.0	5.5	7.1	5.6	6.2	6.4	6.2	6.6	4.2	2.4	2.5	2.7
MIN	3.6	4.7	5.2	4.0	4.1	5.4	5.1	4.0	2.0	1.7	1.6	2.0
CAL YR	2010	TOTAL	1873.9	MEAN	5.13	MAX	16	MIN	2.1	AC-FT	3720	
WTR YR	2011	TOTAL	1546.6	MEAN	4.24	MAX	7.1	MIN	1.6	AC-FT	3070	

MAX DISCH: 8.31 CFS AT 23:45 ON OCT 21,2010 GH 0.60 FT SHIFT 0.06 FT

MAX GH: 0.66 FT AT 13:30 ON FEB 10,2011 (Backwater from ice)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

LONG HOLLOW AT THE MOUTH NEAR RED MESA
WY2011 HYDROGRAPH



SAN JUAN RIVER BASIN
PIONEER DITCH AT THE COLORADO-NEW MEXICO STATELINE
Water Year 2011

Location.--	Lat. 36°59'55", Long. 108°11'12", in NW 1/4 SE 1/4 sec. 10, T.32 N., R.13 W., NMPM, La Plata County.
Drainage Area and Period of Record.--	N/A
Equipment.--	Sutron high data rate Satlink 2 DCP with a shaft encoder in a 30-inch diameter corrugated metal pipe shelter and a 20-inch x 20-inch concrete well. Primary reference gage is outside staff gage (0 to 1.06-ft) installed in flume. Control is a 1-foot concrete Parshall flume. No changes this year.
Hydrologic Conditions.--	Heavy vegetation growth upstream and downstream will cause changes in shifts from year to year. A head gate to the first ditch lateral is located approximately 25-ft below the flume. On occasion the vegetation growth downstream and operations at the head gate can submerge the Parshall flume.
Gage-Height Record.--	The primary record is 15-minute shaft encoder data downloaded from satellite telemetry with the DCP log as backup. The gage was visited on 30 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted 2 times this water year (Apr. 18, 2011 and Apr. 20, 2011). The adjustments made were -0.01 ft and +0.02 ft, respectively. The adjustments were distributed by time to the last known correct readings. Record is complete and reliable.
Datum Corrections.--	Levels have never been run at this gage.
Rating.--	The control is a standard, 1-foot, concrete Parshall flume. Rating No. 01 is a standard 1-ft Parshall flume rating above a gage height of 0.12-ft. The intake to the stilling well is 0.12-ft above the floor of the flume. Flows below a gage height 0.12-ft are assumed to be negligible and a 0 flow is assigned to them. Rating No. 01 has been used since the gage was installed and was used all water year. No discharge measurements were made this water year. Eleven observations of zero flow were made on Oct. 4, Oct. 18, Oct. 25, Nov. 1, Nov. 2, Nov. 8, Nov. 15, 2010, Aug. 29, Sept. 12, Sept. 19, and Sept. 30, 2011. The peak instantaneous flow of 9.38 cfs occurred at 2230 October 21, 2010 at a gage height of 1.75 ft with a shift of 0.00 ft.
Discharge.--	Measurements are made at the staff gage in the flume and well intake. No discharge measurements were made this water year. The discharge record was computed by direct application of the rating to the gage height record.
Special Computations.--	No special computations were necessary this water year
Remarks.--	Record fair for the entire period of record. Station maintained and record developed by Brian Boughton.
Recommendations.--	Currently the bottom of the well is level with the bottom of the intake. Mud and silt can build up enough and not allow the float to settle to the bottom. The existing stilling well should be removed and a deeper one installed or the bottom of the existing well should be removed and excavated deeper.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

PIONEER DITCH AT THE COLORADO-NEW MEXICO STATELINE

RATING TABLE-- PIODITCO01 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

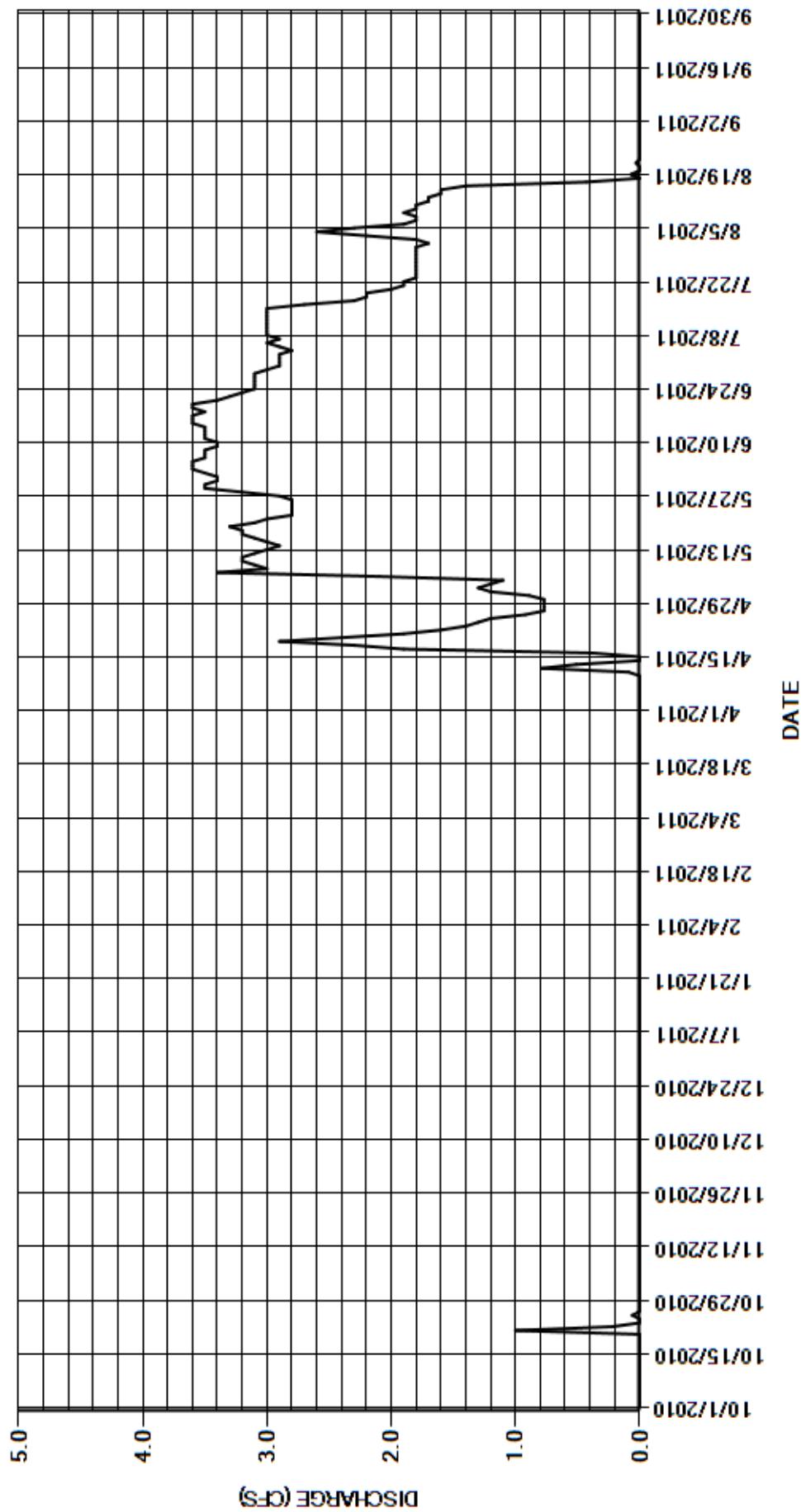
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.89	3.4	2.9	1.7	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.2	3.5	2.9	1.8	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3	3.6	2.9	2.2	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.2	3.6	2.8	2.6	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.1	3.6	2.9	2.3	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	3.5	3.0	1.9	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.4	3.5	2.9	1.8	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0	3.5	3.0	1.8	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.1	3.4	3.0	1.9	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.2	3.4	3.0	1.8	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.09	3.2	3.5	3.0	1.8	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.79	3.1	3.5	3.0	1.7	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.51	3.0	3.5	3.0	1.7	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.9	3.5	3.0	1.6	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.0	3.6	3.0	1.6	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.38	3.1	3.6	2.7	1.4	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	1.9	3.2	3.6	2.3	0.43	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	2.3	3.2	3.5	2.2	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	2.9	3.3	3.6	2.2	0.07	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	2.4	3.1	3.6	2.0	0.00	0.00
21	1.0	0.00	0.00	0.00	0.00	0.00	1.9	3.0	3.4	1.9	0.00	0.00
22	0.22	0.00	0.00	0.00	0.00	0.00	1.6	2.8	3.3	1.9	0.03	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	1.4	2.8	3.2	1.8	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	1.3	2.8	3.1	1.8	0.00	0.00
25	0.06	0.00	0.00	0.00	0.00	0.00	1.2	2.8	3.1	1.8	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.92	2.8	3.1	1.8	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.77	2.9	3.1	1.8	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.77	3.2	3.1	1.8	0.00	0.00
29	0.00	0.00	0.00	0.00	---	0.00	0.77	3.5	3.0	1.8	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	0.77	3.5	2.9	1.8	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	3.4	---	1.8	0.00	---
TOTAL	1.28	0.00	0.00	0.00	0.00	0.00	22.67	85.09	101.8	75.7	30.13	0.00
MEAN	0.041	0.000	0.000	0.000	0.000	0.000	0.76	2.74	3.39	2.44	0.97	0.000
AC-FT	2.5	0	0	0	0	0	45	169	202	150	60	0
MAX	1.0	0.00	0.00	0.00	0.00	0.00	2.9	3.5	3.6	3.0	2.6	0.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.89	2.9	1.8	0.00	0.00
CAL YR	2010	TOTAL	285.39	MEAN	0.78	MAX	4.8	MIN	0.00	AC-FT	566	
WTR YR	2011	TOTAL	316.67	MEAN	0.87	MAX	3.6	MIN	0.00	AC-FT	628	

MAX DISCH: 9.38 CFS AT 22:30 ON OCT 21,2010 GH 1.75 FT SHIFT 0 FT

MAX GH: 1.75 FT AT 22:30 ON OCT 21,2010

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

PIONEER DITCH AT THE COLORADO-NEW MEXICO STATELINE
WY2011 HYDROGRAPH



SAN JUAN RIVER BASIN
ENTERPRISE DITCH AT THE COLORADO-NEW MEXICO STATELINE
Water Year 2011

Location.--	Lat. 37°00'50", Long. 108°11'18", in SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 3, T.32 N., R.13 W., NMPM, La Plata County.
Drainage Area and Period of Record.--	N/A
Equipment.--	Sutron Satlink 2 high data rate DCP with a shaft encoder in a 30-inch diameter corrugated metal pipe shelter and well. Primary reference gage is an outside staff gage installed in flume. Control is a 2-foot concrete Parshall flume. No changes this year.
Hydrologic Conditions.--	The ditch above and below the control is silt with a very well defined stilling pool above the flume. The approach conditions into the flume are good but can degrade if willow growth along the ditch is not maintained. The last time ditch maintenance occurred near the flume was between May 4th and 10th 2006. Silt can deposit in the stilling pool above the flume causing the velocity to increase. Vegetative growth downstream can slow the water and submerge the flume if the ditch is not maintained.
Gage-Height Record.--	The primary record is 15-minute shaft encoder data downloaded from satellite telemetry. The gage was visited on 31 separate occasions this water year to verify the shaft encoder remained calibrated to the primary reference gage. The shaft encoder was adjusted once this water year. Shaft encoder correction was made on April 20, 2011 (+0.01 ft) at 15:30 but subsequently removed at 16:01 on the same day. Record is complete and reliable.
Datum Corrections.--	Levels were not run this water year. Levels were last run on Mar. 2, 2009 using the floor of the flume at the staff gage as the base. Levels were used to determine if the converging section of the flume is level. Results indicate the flume was properly set. No other benchmarks were set at the time.
Rating.--	The control is a 2 foot concrete Parshall flume. Rating No. 01 is a standard 2-ft. Parshall flume rating above a gage height of 0.03 ft. and was used the entire water year. The intake to the stilling well is 0.03 ft. above the floor of the flume. Flows below a gage height 0.03 ft. are assumed to be negligible and a 0 flow is assigned to them. The rating is fairly well defined to 7.4 cfs. Two discharge measurements along with 9 observations of zero flow (Oct. 4, 18, 25; Nov. 1, 2, 8, 15, 29, 2010; and Sep. 30, 2011), were made this water year. They range in discharge from 0.00 to 5.49 cfs. The measurements cover the entire range in stage experienced except for the higher average daily flows of May 2, 8-11, 16-19, 28-30; Jun. 1-5, 2011. The peak instantaneous flow of 6.11 cfs occurred at 0000 May 11, 2011 at a gage height of 0.84 ft with a shift of 0.00 ft. It exceeded the stage of measurement No. 31, made on Jun. 21, 2011 by 0.06 feet in stage.
Discharge.--	Shifting section control method was used for all periods of good record as the range in stage experienced this year was confined to the Parshall flume. Measurements are made at the staff gage in the flume at well intake and staff gage. Shifts were applied as defined by measurements and were distributed by time. All shifts were given full weight except for measurement No. 30 which was discounted -2% to adjust the shift back to the rating. A 0.00 ft. shift was applied for the entire period of record.
Special Computations.--	No special computations were necessary this water year.
Remarks.--	Record is good. Station maintained by Matt Schmitt, Russell Crangle and record developed by Brian Boughton.
Recommendations.--	Additional benchmarks should be established at the gage.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

ENTERPRISE DITCH AT THE COLORADO-NEW MEXICO STATELINE

RATING TABLE-- ENTDITCO01 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

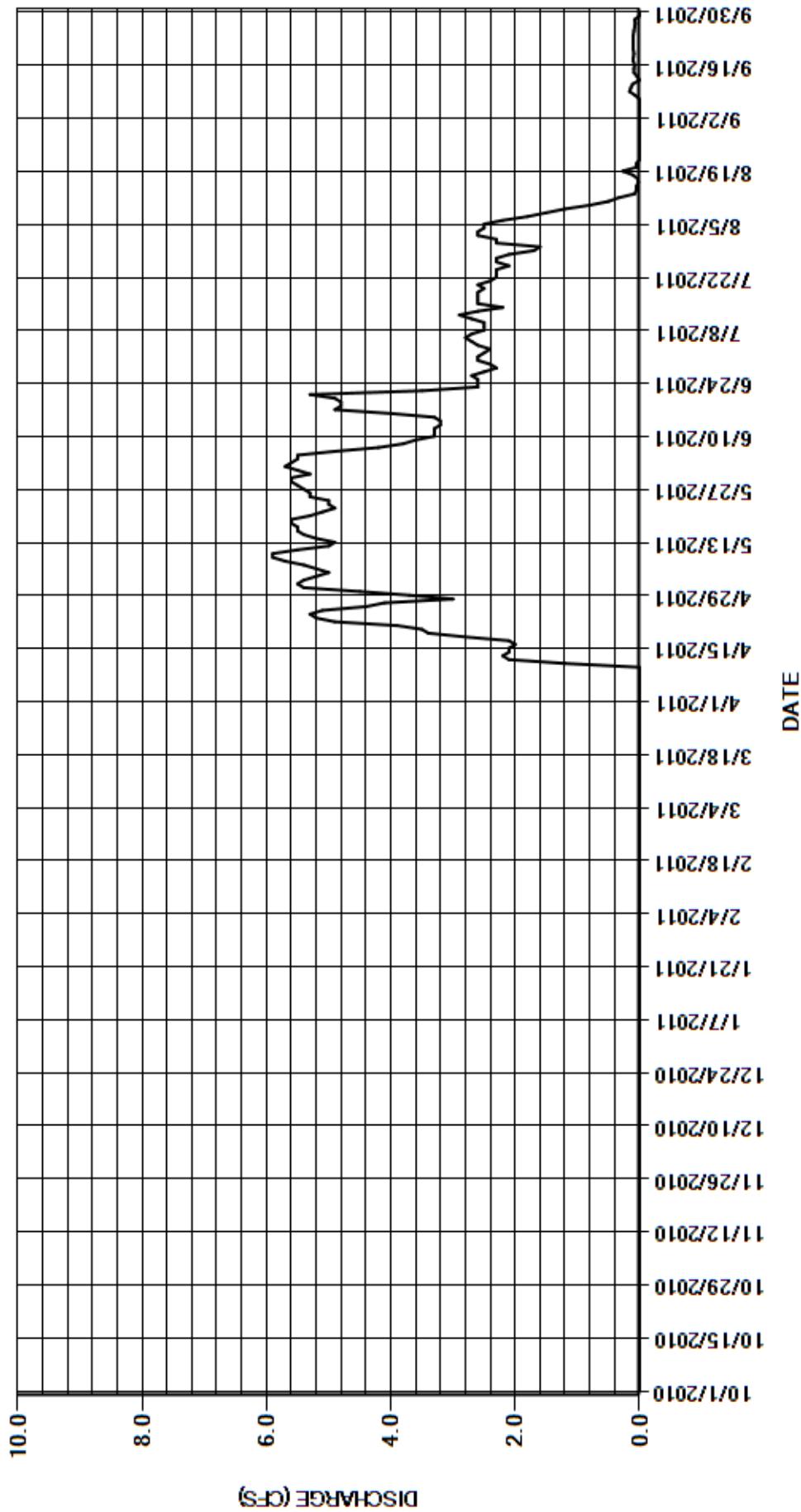
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.4	5.5	2.6	2.3	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.5	5.7	2.5	2.6	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.4	5.6	2.4	2.6	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.2	5.5	2.6	2.5	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.0	5.5	2.7	2.5	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.2	4.9	2.8	2.2	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.4	4.2	2.7	1.8	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.7	3.8	2.5	1.5	0.07
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.9	3.6	2.5	1.2	0.16
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.9	3.3	2.5	0.80	0.14
11	0.00	0.00	0.00	0.00	0.00	0.00	1.2	5.5	3.3	2.7	0.50	0.11
12	0.00	0.00	0.00	0.00	0.00	0.00	2.1	5.0	3.3	2.9	0.33	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	2.2	4.9	3.2	2.6	0.08	0.04
14	0.00	0.00	0.00	0.00	0.00	0.00	2.1	5.2	3.2	2.2	0.05	0.09
15	0.00	0.00	0.00	0.00	0.00	0.00	2.1	5.4	3.3	2.6	0.05	0.09
16	0.00	0.00	0.00	0.00	0.00	0.00	2.0	5.5	4.0	2.6	0.02	0.08
17	0.00	0.00	0.00	0.00	0.00	0.00	2.1	5.5	4.9	2.6	0.03	0.10
18	0.00	0.00	0.00	0.00	0.00	0.00	2.8	5.6	4.8	2.6	0.11	0.10
19	0.00	0.00	0.00	0.00	0.00	0.00	3.4	5.6	4.8	2.5	0.27	0.09
20	0.00	0.00	0.00	0.00	0.00	0.00	3.5	5.3	4.9	2.6	0.05	0.10
21	0.00	0.00	0.00	0.00	0.00	0.00	3.9	5.1	5.3	2.4	0.05	0.10
22	0.00	0.00	0.00	0.00	0.00	0.00	4.9	4.9	3.5	2.3	0.00	0.10
23	0.00	0.00	0.00	0.00	0.00	0.00	5.2	5.0	2.6	2.3	0.00	0.10
24	0.00	0.00	0.00	0.00	0.00	0.00	5.3	5.0	2.6	2.3	0.00	0.10
25	0.00	0.00	0.00	0.00	0.00	0.00	5.1	5.3	2.6	2.1	0.00	0.09
26	0.00	0.00	0.00	0.00	0.00	0.00	4.4	5.3	2.7	2.3	0.00	0.08
27	0.00	0.00	0.00	0.00	0.00	0.00	4.1	5.4	2.5	2.3	0.00	0.07
28	0.00	0.00	0.00	0.00	0.00	0.00	3.0	5.5	2.3	2.1	0.00	0.08
29	0.00	0.00	0.00	0.00	---	0.00	3.7	5.6	2.4	1.7	0.00	0.00
30	0.00	0.00	0.00	0.00	---	0.00	4.5	5.6	2.6	1.6	0.00	0.00
31	0.00	---	0.00	0.00	---	0.00	---	5.3	---	2.3	0.00	---
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	67.60	166.1	116.4	75.4	21.54	1.89
MEAN	0.000	0.000	0.000	0.000	0.000	0.000	2.25	5.36	3.88	2.43	0.69	0.063
AC-FT	0	0	0	0	0	0	134	329	231	150	43	3.7
MAX	0.00	0.00	0.00	0.00	0.00	0.00	5.3	5.9	5.7	2.9	2.6	0.16
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.9	2.3	1.6	0.00	0.00
CAL YR	2010	TOTAL	441.57	MEAN	1.21	MAX	7.3	MIN	0.00	AC-FT	876	
WTR YR	2011	TOTAL	448.93	MEAN	1.23	MAX	5.9	MIN	0.00	AC-FT	890	

MAX DISCH: 6.11 CFS AT 00:00 ON MAY 11,2011 GH 0.84 FT SHIFT 0 FT

MAX GH: 0.84 FT AT 00:00 ON MAY 11,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

ENTERPRISE DITCH AT THE COLORADO-NEW MEXICO STATELINE
WY2011 HYDROGRAPH



SAN JUAN RIVER BASIN

09366500 LA PLATA RIVER AT THE COLORADO-NEW MEXICO STATELINE

Water Year 2011

Location.--	Lat. $36^{\circ}59'59''$, Long. $108^{\circ}11'17''$, in NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 10, T.32 N., R.13 W., NMPM, La Plata County, CO, Hydrologic Unit 14080105, on right bank at Colorado-New Mexico State line, 0.5 mi downstream of Johnny Pond Arroyo, and 4.9 mi north of La Plata, NM.
Drainage Area and Period of Record.--	331 mi ² . Jan. 1920 to current year. Monthly data only for some periods.
Equipment.--	Graphic water stage-recorder and Sutron Satlink 2 DCP and shaft encoder on separate floats in a 42-inch diameter CMP well and 64-inch by 64-inch cement block shelter. The floats are located inside of a 14 inch PVC oil cylinder. The primary reference gage is an electric drop tape inside the gage house. A drop tape is used to reference the gage inside the oil cylinder when the well is frozen. The station is also equipped with an air temperature sensor. The control is a compound concrete long throated flume, hereafter referred to as a "ramp flume". A foot bridge located 6-feet below the gage house is used for access and to make high flow measurements.
Hydrologic Conditions.--	The drainage area above the gage is 331 square miles. The basin begins in high mountain terrain above 11,000 feet and drops to 5,972 feet at the gage. The gage is located at the Colorado-New Mexico Stateline. The basin mainly consists of rock and forested mountains from an elevation of 11,000 feet to 8,000 feet (Hesperus) and changes to agricultural from Hesperus to the Stateline. Silt and gravel are deposited in the stilling pool above the control during low flow and scour during moderate to high flow events. Many diversions for irrigation occur above this gage.
Gage-Height Record.--	The primary record is 15-minute shaft encoder data downloaded from satellite telemetry with DCP download data and graphic chart record for backup purposes. Satellite telemetry data is complete except for 1345 on May 16, 2011 to 1030 on May 17, 2011. Data downloaded from the DCP was used to fill in missing satellite telemetry data. The gage was visited on 57 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted 5 times this water year (Oct. 1, 2010, Dec. 14, 2010, Mar. 21, 2011, Apr. 8, 2011 and Jul. 6, 2011). The adjustment made were -0.01, +0.01, +0.01, -0.01 and +0.01 feet respectively. One flush correction was made this water year. The flush correction occurred on Jun. 13, 2011(+0.06 ft). The flush correction was distributed by time within the final record to smooth the correction. The record is complete and reliable. The stage discharge relationship was affected by ice on the control on: Nov. 26-30; Dec, 1-4, 29-31, 2010; Jan. 1-30; Feb. 2-14, 2011.
Datum Corrections.--	Levels were not run this water year. Levels were last run on September 22, 2009 to the electric tape index (ET index) using RM #3 as the base. The ET index was found to be reading -0.002 feet low. No corrections were made since the ET index was found to be within the allowable error tolerances. Levels were also run to the two other reference marks (RM#4 and RM#5). RM#4 was found to be reading +0.006 feet high and RM#5 was found to be reading +0.014 feet high. No corrections were made to the supplemental reference marks.
Rating.--	The ramp flume contains three definitive flow control zones. The low flow zone looks like a concrete broad-crested Cipolletti weir, ranges in stage from 2.80 ft. to 3.30 ft. (or 0 cfs to approximately 1.16 cfs). The middle zone is concrete and ranges in stage from 3.30 ft. to 5.37 ft. or 1.16 cfs to 320 cfs. At higher flows ($GH = 5.37$ ft. to 8.40 ft.) channel will overbank on the left side into a natural section lined with grass, trees and willows. The control section is located about 14 feet below the inlets to the gage. The point-of-zero-flow (PZF) is approximately 2.80 ft. The PZF was measured on Nov. 02, 2010 and Sep. 30, 2011. Nineteen measurements (No. 1413-1431) were made during the water year. They range in discharge from 0.25 to 139 cfs. They cover the high range in stage experienced and the lower range in stage except for the lower daily flows of Aug. 14, 16; Sep. 28, 2011. Rating table No. 33 was developed on Oct. 1, 2008 and was used the entire water year. It is fairly well defined from 0.20 to 572 cfs. The upper end of the rating table (above 1200 cfs) is based on the poor measurement made Sept. 9, 2003. The peak instantaneous flow of 247 cfs occurred at 2230 Aug. 21, 2011 at a gage height of 5.07 ft with a shift of 0.00 ft. It exceeded the stage of Msmt. No. 1424, made Jun. 7, 2011 by 0.43 ft.
Discharge.--	Shifts were applied as defined by measurements and were distributed by time and stage. The shift at the end of Water Year 2010 was 0.00 ft. and continued throughout entire winter period in Water Year 2011. Shifts through the winter period were defined by measurement Nos. 1413 to 1418. Shifts were distributed by time from 0000 Oct. 1, 2010 until 1630 Feb. 14, 2010 which is the first measurement (No. 1418) after the ice affected record. Shifts were then distributed by stage utilizing shift curve LAPMEXCO11VSA as defined by measurement Nos. 1418 - 1431, from 1645 Feb. 14, 2011 until the end of the water year. Open-water measurements showed shifts varying between -0.02 and +0.02 feet. Shifts were applied directly and given full weight except measurement Nos. 1414, 1417, 1420, 1421, 1423, 1424, 1425, 1426, 1428, 1430 which were discounted from -7% to 6% to smooth shift distribution.
Special Computations.--	Discharge for the days when ice affected the gage height record was estimated on the basis of partial days of good record, good gage data before and after ice affected data, air temperature data collected at the gage and the stream flow record from Long Hollow. A hydrograph was used to compare the Stateline flows with the flows at the Long Hollow gage during ice affected periods.
Remarks.--	Record good, except for the period from Nov. 26-30; Dec, 1-4, 29-31, 2010; Jan. 1-30; Feb. 2-14, 2011, in which ice affected the stage-discharge relationship. Record during this period is estimated and should be considered poor. Station maintained by Matt Schmitt, Russell Crangle and Brian Boughton. Record developed by Brian Boughton.
Recommendations.--	None.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

09366500 LA PLATA RIVER AT THE COLORADO-NEW MEXICO STATELINE

RATING TABLE-- LAPMEXCO33 USED FROM 01-OCT-2010 TO 30-SEP-2011

DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011

MEAN VALUES

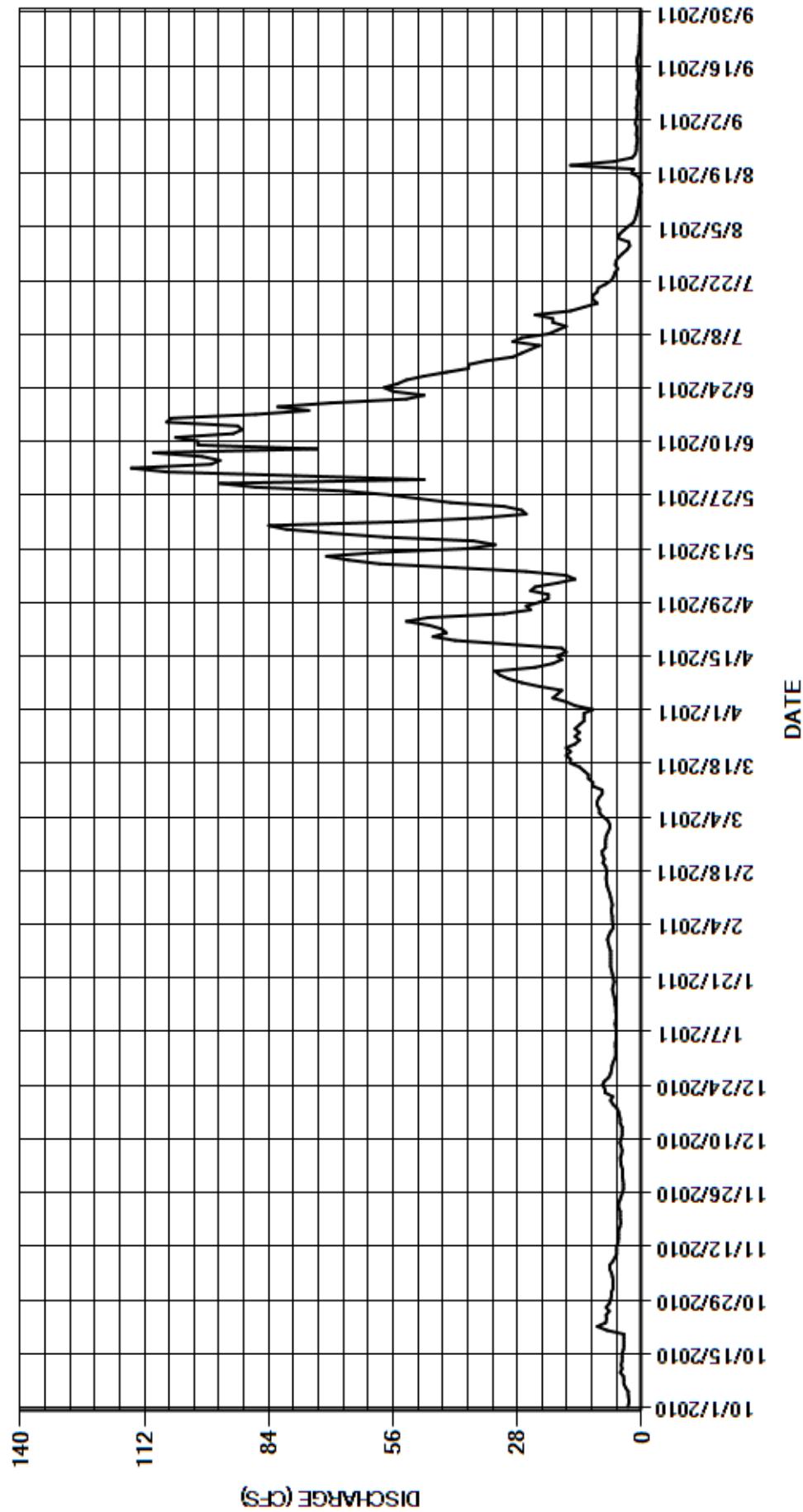
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.1	6.4	e4.3	e5.8	7.4	7.2	11	21	78	35	2.9	1.4
2	2.9	6.4	e4.3	e5.8	e7.0	7.2	15	25	107	29	5.4	1.2
3	2.9	6.4	e4.6	e5.9	e6.4	7.6	17	24	115	27	5.0	0.97
4	3.0	6.6	e4.7	e5.9	e6.5	8.7	20	19	97	25	4.1	0.99
5	3.0	6.8	4.8	e5.7	e6.6	9.5	19	15	95	23	3.1	1.2
6	3.6	7.2	4.5	e5.7	e6.6	9.5	18	17	99	29	1.9	1.0
7	4.0	7.2	4.4	e5.7	e6.8	10	23	26	110	27	1.5	1.0
8	4.0	6.5	4.6	e5.8	e6.8	10	27	42	73	21	1.2	0.86
9	4.1	6.0	4.9	e6.0	e6.6	9.6	30	59	100	19	1.0	0.68
10	4.8	5.6	4.6	e5.8	e6.8	8.9	32	66	100	17	0.82	0.97
11	4.4	5.6	4.4	e5.7	e7.0	8.9	33	71	105	20	0.66	0.94
12	4.6	5.6	4.4	e5.8	e7.2	11	24	59	92	20	0.59	0.90
13	4.4	5.3	4.4	e5.8	e7.5	11	20	39	90	24	0.45	0.67
14	4.4	5.2	4.8	e6.0	e7.8	12	18	33	91	16	0.20	0.72
15	4.4	5.2	4.8	e6.0	7.9	12	19	38	107	13	0.36	0.96
16	4.1	5.2	5.0	e6.2	8.0	13	17	58	106	10	0.11	0.92
17	4.0	4.9	5.2	e6.4	7.9	14	18	70	87	11	0.42	1.1
18	4.0	4.7	5.6	e6.6	7.9	16	30	80	75	11	0.71	0.98
19	4.0	4.8	6.5	e6.4	8.1	16	42	84	82	10	2.3	0.72
20	4.0	4.8	7.0	e6.2	8.7	17	47	54	70	9.8	1.8	0.58
21	7.8	4.8	6.5	e6.4	8.4	16	44	36	53	8.1	16	0.53
22	10	5.2	8.2	e6.6	8.8	17	45	26	49	6.8	6.2	0.48
23	8.1	5.2	8.3	e6.8	8.9	15	48	27	56	6.3	2.1	0.45
24	7.9	4.9	8.8	e7.0	8.1	14	53	31	58	6.0	1.4	0.43
25	8.0	4.6	8.4	e7.0	8.1	15	48	43	55	5.4	1.2	0.37
26	7.3	e4.3	7.4	e7.0	8.1	14	31	50	53	5.9	1.2	0.34
27	8.0	e4.1	7.0	e7.0	8.0	15	25	57	49	5.8	1.0	0.26
28	7.3	e4.1	6.8	e7.0	7.6	14	26	67	44	5.2	0.96	0.24
29	7.0	e4.2	e6.7	e7.3	---	13	23	87	39	4.3	1.2	0.28
30	6.8	e4.3	e6.4	e7.5	---	13	21	95	39	3.3	1.1	0.26
31	6.8	---	e6.0	7.7	---	13	---	49	---	2.7	1.1	---
TOTAL	162.7	162.1	178.3	196.5	211.5	378.1	844	1468	2374	456.6	67.98	22.40
MEAN	5.25	5.40	5.75	6.34	7.55	12.2	28.1	47.4	79.1	14.7	2.19	0.75
AC-FT	323	322	354	390	420	750	1670	2910	4710	906	135	44
MAX	10	7.2	8.8	7.7	8.9	17	53	95	115	35	16	1.4
MIN	2.9	4.1	4.3	5.7	6.4	7.2	11	15	39	2.7	0.11	0.24
CAL YR	2010	TOTAL	7409.00	MEAN	20.3	MAX	203	MIN	1.2	AC-FT	14700	
WTR YR	2011	TOTAL	6522.18	MEAN	17.9	MAX	115	MIN	0.11	AC-FT	12940	

MAX DISCH: 247 CFS AT 22:30 ON AUG 21,2011 GH 5.07 FT SHIFT 0 FT

MAX GH: 5.07 FT AT 22:30 ON AUG 21,2011

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

09366500 LAPLATA RIVER AT THE COLORADO-NEW MEXICO STATELINE
WY2011 HYDROGRAPH



SAN JUAN RIVER BASIN
MANCOS RIVER NEAR MANCOS
Water Year 2011

Location.--	Lat. 37°21'15", Long. 108°15'33", in NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 27, T.36 N., R.13 W., NMPM, Montezuma County, Hydrologic Unit 14080107, on the right bank 0.32 miles downstream of the confluence of the East and West Mancos River, 2 miles upstream from the town of Mancos, CO.
Drainage Area and Period of Record.--	72.6 mi ² . Published by the USGS Oct. 1, 1931 to Sept. 30, 1938. Published by the Colorado Division of Water Resources Nov. 1953 to present.
Equipment.--	Graphic water stage-recorder and a Sutron Satlink 2 DCP with a shaft encoder on a separate float in a concrete block shelter and a 42 in CMP well. The primary reference gage is a steel drop tape referenced to an adjustable reference point (RP). An air temperature gage was added to the station this year on Oct 6 2010. No other changes.
Hydrologic Conditions.--	Large cobbles and boulders line the channel above and below the gage. Diversions for irrigation and filling reservoirs affect the flow at the gage.
Gage-Height Record.--	The primary record is 15-minute shaft encoder data downloaded from satellite telemetry with the DCP and chart record used for backup purposes. The gage was visited on 32 separate occasions this water year to verify the instruments remained calibrated to the primary reference gage. The shaft encoder was adjusted four times throughout the year, ranging from -0.04 ft to +0.05 ft. Six flush corrections were made this water year. The flush corrections occurred on Nov 3 (+0.03 ft., +0.02 ft was applied to the record), Apr 14 (+0.03 ft.), May 11 (+0.04 ft.), May 17 (+0.04 ft.), May 31 (+0.02 ft.) and June 15 (+0.07 ft.). The flush corrections were distributed by time within the final record depending on the location of the inflection point on the hydrograph.. Gage height data, shaft encoder corrections and flush corrections from Oct. 1, 2010 to Nov. 3, 2010 were not always reliable due to sediment around the base of the oil cylinder. The oil cylinder was raised above the sediment on Nov. 3, 2010. The well was cleaned out with a pump on Nov. 18. The gage height during this period was estimated. The record is complete and reliable, except for the following days when the stage discharge relationship was affected by ice: Nov. 12-14, 16-19, 23, 25-27, 29-30; Dec. 1-2, 8, 13, 27-31, 2010, Jan. 1-5, 11-12, 20-31; Feb. 1-4, 6-11, 21-23, 28; March 1, 5-6, 9, 2011.
Datum Corrections.--	Levels were run this water year on Oct. 6, 2010 using the reference point (RP) as the base. The benchmarks established on Aug. 16, 2007 were not used because the level loop did not close within allowable error tolerances. Elevations on BM#1 and BM#2 were established from the Oct. 6, 2010 set of levels. No adjustments to the datum were made.
Rating.--	The control is a rock riffle located directly below the gage. The channel is the control at high flow. Gravel and sand fill and scour on the control section causing shifts. Rating No. 10, in use since October 28, 2008, was used for the entire water year. It is well defined from 0.99 cfs to 800 cfs. Nineteen measurements (Nos. 631 - 649) were made during the water year ranging in discharge from 5.99 cfs to 186 cfs. They cover the range in stage experienced except for the lower average daily flows of Oct 3, 5, 2010 and the higher average daily flows of May 29-30; June 3, 5-7, 2011. The peak instantaneous flow of 335 cfs occurred at 2330 on June 6, 2011 at a gage height of 4.79 ft. with a shift of -0.01 ft. It exceeded the stage of measurement No. 642, made May 31, 2011 by 0.27 feet in stage. The peak instantaneous stage of 4.98 ft. occurred at 0830 on Feb. 4, 2011, and was caused by backwater from ice on the control.
Discharge.--	Shifting control method was used during the entire water year. Shifting is caused mainly by gravel and sand filling and scouring on the control section. Shifts were distributed by time from the beginning of the water year until March 11, 2011. Shifts were distributed by stage using variable shift curve MANMANCOVS11A from March 11, 2011 until the peak on June 6, 2011. Shifts were distributed by stage using variable shift curveMANMANCOVS11B from June 6, 2011 to August 3, 2001. Measurements show unadjusted shifts varying from +0.06 feet to -0.04 feet. Shifts were applied directly and given full weight except Measurement Nos. 631, 633, 634, 636, 637, 638, 640, 642, 643, 646 and 647, which were discounted from -10% to +8% to smooth shift distribution. Measurement No. 634 was performed on Nov. 18 while the well was being flushed and there is no electronic gage height record. Gage height record was replaced by prorated tape readings before and after the measurement.
Special Computations.--	Discharge for periods of ice affect were estimated on the basis of partial day record, interim good record, and air temperature record at the gage.
Remarks.--	Record good, except for those periods of ice affected records, which are estimated and poor. The record from the beginning of the water year until the oil tube was raised on Nov. 3 should be considered fair. Station maintained by Div 7 staff and record developed by Brian Leavesley.
Recommendations.--	A threshold should be installed to prevent mice and rodents from entering the shelter.

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF STATE ENGINEER

MANCOS RIVER NEAR MANCOS

RATING TABLE.-- MANMANCO10 USED FROM 01-OCT-2010 TO 30-SEP-2011

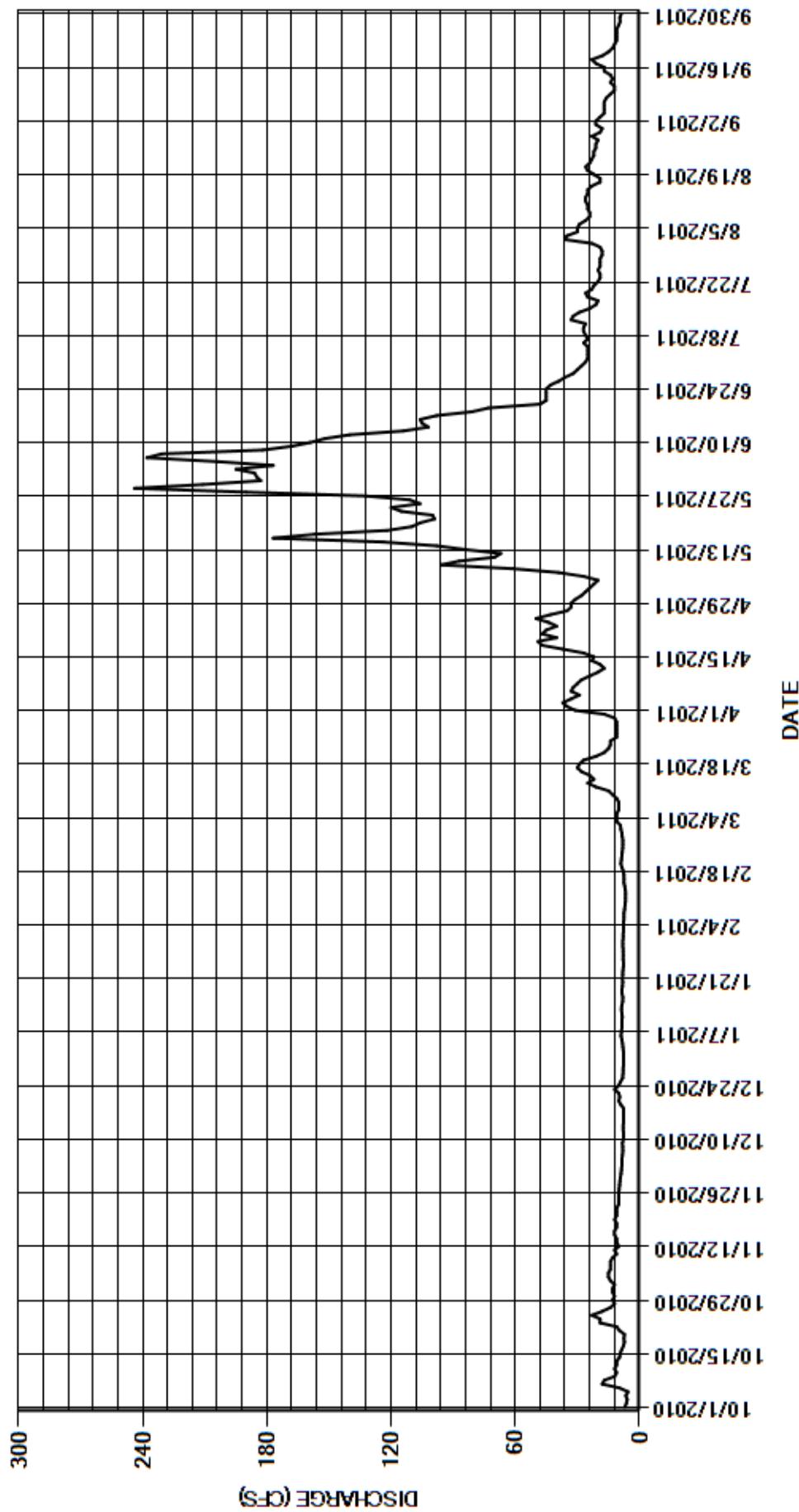
DISCHARGE, IN CFS, WATER YEAR OCTOBER 2010 TO SEPTEMBER 2011												
DAY	MEAN VALUES											
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.1	13	e8.9	e7.6	e7.8	e9.0	31	28	185	26	23	21
2	6.3	12	e8.7	e7.8	e7.8	9.2	35	26	186	25	36	21
3	5.9	14	8.5	e8.0	e7.7	11	37	24	195	25	35	19
4	6.6	15	8.5	e8.2	e7.7	11	33	22	177	25	30	17
5	5.5	15	8.4	e8.5	7.6	e11	29	20	204	25	30	17
6	9.7	14	8.2	8.9	e7.5	e10	33	27	238	27	29	17
7	18	14	8.0	8.7	e7.5	9.9	32	39	231	25	26	17
8	17	14	e8.1	8.5	e7.2	10	30	61	182	26	24	16
9	12	13	8.2	8.5	e7.0	e11	28	96	168	27	24	14
10	11	11	7.7	8.4	e6.8	13	24	87	159	27	25	12
11	12	12	7.7	e8.3	e6.8	15	20	70	152	26	25	12
12	11	e10	7.8	e8.5	6.7	21	17	67	140	33	26	14
13	11	e11	e7.8	8.7	6.8	25	19	84	114	32	26	13
14	9.6	e11	7.8	8.5	7.1	22	23	98	102	29	25	14
15	9.3	12	7.7	8.1	7.5	24	22	124	105	24	25	17
16	8.6	e12	7.7	8.0	7.4	28	27	177	106	21	23	17
17	7.7	e11	7.6	8.4	7.5	30	37	157	98	20	19	21
18	7.3	e11	7.6	8.5	7.8	29	47	122	81	25	19	23
19	7.5	e12	9.0	8.2	8.5	27	49	110	73	26	22	18
20	7.2	11	10	e8.1	9.0	21	40	106	48	23	25	15
21	9.7	11	9.5	e8.2	e8.7	17	47	99	45	22	26	13
22	11	11	10	e8.1	e8.5	15	45	100	45	20	24	12
23	19	e10	12	e8.0	e8.3	14	40	115	45	19	23	11
24	19	10	10	e7.8	8.1	14	44	120	45	19	22	11
25	23	e10	9.1	e7.7	8.0	11	50	106	43	20	22	11
26	18	e10	8.1	e7.9	8.0	11	43	111	39	19	21	11
27	14	e9.8	e8.0	e7.8	8.3	11	35	132	36	19	21	10
28	12	9.6	e7.9	e7.9	e8.5	11	33	190	32	19	20	9.3
29	13	e9.4	e7.8	e8.0	---	11	33	244	30	18	23	9.5
30	12	e9.2	e7.7	e8.0	---	12	31	211	28	18	19	8.7
31	13	---	e7.6	e8.0	---	17	---	183	---	19	18	---
TOTAL	354.0	348.0	261.6	253.8	216.1	491.1	1014	3156	3332	729	756	441.5
MEAN	11.4	11.6	8.44	8.19	7.72	15.8	33.8	102	111	23.5	24.4	14.7
AC-FT	702	690	519	503	429	974	2010	6260	6610	1450	1500	876
MAX	23	15	12	8.9	9.0	30	50	244	238	33	36	23
MIN	5.5	9.2	7.6	7.6	6.7	9.0	17	20	28	18	18	8.7
CAL YR	2010	TOTAL	8631.7	MEAN	23.6	MAX	201	MIN	2.1	AC-FT	17120	
WTR YR	2011	TOTAL	11353.1	MEAN	31.1	MAX	244	MIN	5.5	AC-FT	22520	

MAX DISCH: 335 CFS AT 23:30 ON JUN 06,2011 GH 4.79 FT SHIFT -0.01 FT

MAX GH: 4.98 FT AT 08:30 ON FEB 04,2011 (Backwater from ice)

FOR MORE COMPLETE OR DETAILED INFORMATION SEE DAILY OR MONTHLY RECORD.

MANCOS RIVER NEAR MANCOS
WY2011 HYDROGRAPH



Station Identification Codes

DIV I

CODE	NAME
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ADATUNCO	ALVA B. ADAMS TUNNEL AT EAST PORTAL, NEAR ESTES PARK
ADANETCO	ALVA B. ADAMS TUNNEL AT EAST PORTAL (NET), NEAR ESTES PARK
BCRMORCO	BEAR CREEK AT MORRISON
BCRSHECO	BEAR CREEK AT SHERIDAN
BERDITCO	BERTHOUD PASS DITCH AT BERTHOUD PASS
BFCLYOCO	BOULDER CREEK FEEDER CANAL NEAR LYONS
BIGLASCO	BIG THOMPSON AT MOUTH, NEAR LA SALLE
BOBGLNCO	BOB CREEK DITCH NEAR GLENDEVEY
BOCBGRCO	SOUTH BOULDER CREEK BELOW GROSS RESERVOIR
BOCELSCO	SOUTH BOULDER CREEK NEAR ELDORADO SPRINGS
BOCMIDCO	MIDDLE BOULDER CREEK AT NEDERLAND
BOCOBODO	BOULDER CREEK AT BOULDER
BOCOROCO	BOULDER CREEK NEAR ORODELL
BORDITCO	BOREAS PASS DITCH AT BOREAS PASS
BOSDELCO	SOUTH BOULDER CREEK, DIVERSION NR ELDORADO SPRINGS
BTABESCO	BIG THOMPSON RIVER ABOVE LAKE ESTES
BTBLESCO	BIG THOMPSON RIVER BELOW LAKE ESTES
BTCANYCO	BIG THOMPSON RIVER AT MOUTH OF CANYON, NEAR DRAKE
BTPPMCCO	CHARLES HANSEN FEEDER CANAL POWER PLANT TO BIG THOMPSON
BUCRMVCO	BUCKHORN CREEK NEAR MASONVILLE
BTNFDRCO	NORTH FORK BIG THOMPSON RIVER AT DRAKE
CAPDCPCO	CAMERON PASS DITCH NEAR CAMERON PASS
CLAFTCCO	CACHE LA POUDRE AT CANYON MOUTH, NEAR FORT COLLINS
CLAGRECO	CACHE LA POUDRE NEAR GREELEY
CLAWASCO	CACHE LA POUDRE AT GREELEY WASTEWATER TREATMENT PLANT
CLEDERCO	CLEAR CREEK AT DERBY
COCREPCO	COAL CREEK NEAR PLAINVIEW
DEADDPCO	DEADMAN DITCH NEAR DEADMAN PARK
DILTUNCO	DILLE TUNNEL NEAR DRAKE
FALIDACO	FALL RIVER AT MOUTH NEAR IDAHO SPRINGS
FISHESCO	FISH CREEK NEAR ESTES PARK
GRNDRDCO	GRAND RIVER DITCH AT LA POUDRE PASS
GUMCLRCO	A.P. GUMLICK TUNNEL RELEASE TO CLEAR CREEK AT JONES PASS
HFCBBSCO	CHARLES HANSEN FEEDER CANAL BELOW BIG THOMPSON SIPHON
HFCWASCO	CHARLES HANSEN FEEDER CANAL WASTEWAY TO BIG THOMPSON
HOMSPICO	AURORA HOMESTAKE PIPELINE
HSPTUNCO	HOOSIER PASS TUNNEL AT MONTGOMERY RES., NEAR ALMA
LAPTUNCO	LARAMIE POUDRE TUNNEL
LEFTHDCO	LEFTHAND DIVERSION S. ST. VRAIN CREEK NEAR WARD
LTCANYCO	LITTLE THOMPSON RIVER AT CANYON MOUTH, NEAR BERTHOUD
MICDCPCO	MICHIGAN DITCH AT CAMERON PASS
MIDSTECO	MIDDLE ST. VRAIN CREEK NR. PEACEFUL VALLEY
MOFTUNCO	MOFFAT WATER TUNNEL, GILPIN COUNTY
OLYTUNCO	OLYMPUS TUNNEL (ESTES FOOTHILLS CANAL) AT LAKE ESTES
ONEJURCO	SOUTH PLATTE RIVER AT JULESBURG CHANNEL #1
PIOHDGCO	PIONEER DITCH AT HEADGATE
PIOSTLCO	PIONEER DITCH AT CO/NE STATE LINE
PLAANTCO	SOUTH PLATTE RIVE BELOW ANTERO RESERVOIR
PLABALCO	SOUTH PLATTE RIVER AT COOPER BRIDGE, NEAR BALZAC
PLACHACO	SOUTH PLATTE RIVER BELOW CHATFIELD RESERVOIR
PLACHECO	SOUTH PLATTE RIVER BL. CHEESMAN RESERVOIR
PLADENCO	SOUTH PLATTE RIVER AT DENVER
PLAGEOCO	SOUTH PLATTE RIVER NEAR LAKE GEORGE
PLAGRACO	NORTH FORK SOUTH PLATTE RIVER AT GRANT
PLAHARCO	SOUTH PLATTE RIVER ABOVE ELEVENMILE RESERVOIR
PLAHENCO	SOUTH PLATTE RIVER AT HENDERSON
PLAJUCCO	SOUTH PLATTE RIVER AT JULESBURG COMBINED
PLAJULCO	SOUTH PLATTE RIVER AT JULESBURG LEFT CHAN. #4
PLAJURCO	SOUTH PLATTE RIVER AT JULESBURG RIGHT CHAN. #2
PLAKERCO	SOUTH PLATTE RIVER NEAR KERSEY
PLASPICO	SOUTH PLATTE RIVER ABOVE SPINNEY RESERVOIR
PLASPLCO	SOUTH PLATTE RIVER AT SOUTH PLATTE
PLASTRCO	SOUTH PLATTE RIVER BELOW STRONTIA SPRINGS
PLAWATCO	SOUTH PLATTE RIVER AT WATERTON
PLAWELCO	SOUTH PLATTE RIVER NEAR WELDONA
ROBTUNCO	ROBERTS TUNNEL AT EAST PORTAL NEAR GRANT
SKYDCLCO	SKYLINE DITCH AT CHAMBERS LAKE
SSVWARCO	SOUTH ST. VRAIN NEAR WARD
STCTUNCO	STRAIGHT CREEK TUNNEL AT EISENHOWER TUNNEL
STLINECO	STATELINE DITCH RETURN NEAR JULESBURG
SVCLYOCO	SAINT VRAIN CREEK AT LYONS
SVCPLACO	ST. VRAIN CREEK AT MOUTH, NEAR PLATTEVILLE

SVSLYOCO	ST. VRAIN SUPPLY CANAL NEAR LYONS
TARBORCO	TARRYALL CREEK AT BORDEN DITCH NEAR JEFFERSON
TARTARCO	TARRYALL CREEK BELOW TARRYALL RESERVOIR
VIDTUNCO	VIDLER TUNNEL NEAR ARGENTINE PASS
WINDESCO	WIND RIVER NEAR ESTES PARK
WINBYPCO	WIND RIVER BY-PASS NEAR ESTES PARK
WSDEARCO	WILSON SUPPLY DITCH NEAR EATON RESERVOIR

DIV II

CODE	NAME
ARKCACCO	ARKANSAS RIVER AND CATLIN CANAL COMBINED
ARKCANCO	ARKANSAS RIVER AT CANYON CITY
ARKCARCO	ARKANSAS RIVER BELOW X-Y DITCH DAM NEAR CARLTON
ARKCATCO	ARKANSAS RIVER BELOW CATLIN DAM NEAR FOWLER
ARKGRNCO	ARKANSAS RIVER AT GRANITE
ARKLAJCO	ARKANSAS RIVER AT LA JUNTA
ARKNEPCO	ARKANSAS RIVER NEAR NEPESTA
ARKNECCO	ARKANSAS RIVER AT NEPESTA ROAD BRIDGE COMBINED
ARKPORCO	ARKANSAS RIVER AT PORTLAND
ARKPUECO	ARKANSAS RIVER ABOVE PUEBLO
ARKROCCO	ARKANSAS RIVER AT ROCKY FORD
ARKSALCO	ARKANSAS RIVER AT SALIDA
ARKWELCO	ARKANSAS RIVER NEAR WELLSVILLE
BOUTUNCO	CHARLES H. BOUSTEAD TUNNEL
BUSTUNCO	BUSK-IVANHOE TUNNEL
CATCANCO	CATLIN CANAL AT CATLIN DAM, NEAR FOWLER
CANSWKCO	CROOKED ARROYO NEAR SWINK
CCACCRCO	CLEAR CREEK ABOVE CLEAR CREEK RESERVOIR
CCBCCRCO	CLEAR CREEK BELOW CLEAR CREEK RESERVOIR
CHCRNACO	CHALK CREEK AT NATHROP
COLDITCO	COLUMBINE DITCH
COCRBVCO	COTTONWOOD CREEK NEAR BUENA VISTA
CRBRLVCO	CUCHARAS RIVER AT BOYD RANCH NEAR LA VETA
CRHBLVCO	CUCHARAS RIVER AT HARRISON BRIDGE NEAR LA VETA
EWIDITCO	EWING DITCH
GRAWESCO	GRAPE CREEK NEAR WESTCLIFFE
HILCANCO	HIGHLAND CANAL BELOW HIGHLAND DAM NEAR LAS ANIMAS
HOMTUNCO	HOMESTAKE TUNNEL
HRC194CO	HORSE CREEK AT HIGHWAY 194
HURREDCO	HUERFANO RIVER NEAR REDWING
LAKATLCO	LAKE CREEK ABOVE TWIN LAKES RESERVOIR
LAKBTLCO	LAKE CREEK BELOW TWIN LAKES RESERVOIR
LARDITCO	LARKSPUR DITCH AT MARSHALL PASS
LFCBSLCO	LAKE FORK CREEK BELOW SUGAR LOAF DAM NR. LEADVILLE
MUDTOOCO	MUDGY CREEK NEAR TOONERVILLE
NMCHIGCO	NINEMILE CANAL AT NINEMILE DAM NEAR HIGBEE
OXFDITCO	OXFORD FARMERS DITCH NEAR NEPESTA
PURHILCO	PURGATOIRE RIVER BELOW HIGHLAND DAM NEAR LAS ANIMAS
PURHICCO	PURGATOIRE RIVER BELOW HIGHLAND DAM NEAR LAS ANIMAS (COMBINED)
PURNICCO	PURGATOIRE R AT NINEMILE DAM, NR HIGBEE COMBINED
PURNINCO	PURGATOIRE RIVER AT NINEMILE DAM, NEAR HIGBEE
PURTRICO	PURGATOIRE RIVER AT TRINIDAD
RACRSTCO	RATON CREEK ABOVE STARKVILLE
RULTOOCO	RULE CREEK NEAR TOONERVILLE
TWITUNCO	TWIN LAKES TUNNEL
WURDITCO	WURTZ DITCH NEAR TENNESSEE PASS
WUREXTCO	WURTZ EXTENSION DITCH NEAR TENNESSEE PASS

DIV III

CODE	NAME
ALABELCO	ALAMOSA CREEK BELOW TERRACE RESERVOIR
ALARANCO	ALAMOSA RIVER BELOW RANGER CREEK
ALATERCO	ALAMOSA CREEK ABOVE TERRACE RESERVOIR
ALAWIGCO	ALAMOSA RIVER ABOVE WIGHTMAN FORK NEAR JASPER
BIGSPGCO	BIG SPRING CREEK AT MEDANO RANCH NEAR MOSCA
CARLAGCO	CARNERO CREEK NEAR LA GARITA
CBPALACO	CLOSED BASIN PROJECT CANAL NEAR ALAMOSA
CHECRECO	CHERRY CREEK NEAR CRESTONE
COCRMICO	COTTON CREEK NEAR MINERAL HOT SPRINGS
COCRESCO	COTTONWOOD CREEK NEAR CRESTONE
CONLASCO	COMBINED CONEJOS RIVER (NORLASCO SOULASCO)

CONMOGCO	CONEJOS RIVER NEAR MOGOTE
CONPLACO	CONEJOS RIVER BELOW PLATORO RESERVOIR
CULSANCO	CULEBRA CREEK AT SAN LUIS
DEDMOUCO	DEADMAN CREEK AT MOUTH OF CANYON NEAR CRESTONE
DEDCRECO	DEADMAN CREEK NEAR CRESTONE
DLFDT0CO	DON LA FONT DITCH, COMBINED, AT PIEDRA PASS
DLFDT1CO	DON LA FONT DITCH NO. 1 AT PIEDRA PASS
DLFDT2CO	DON LA FONT DITCH NO. 2 AT PIEDRA PASS
GARVILCO	GARNER CREEK NEAR VILLA GROVE
GOOWAGCO	GOOSE CREEK AT WAGONWHEEL GAP
KERVILCO	KERBER CREEK NEAR VILLA GROVE
LAGLAGCO	LA GARITA CREEK NEAR LA GARITA
LAJCAPCO	LAJARA CREEK AT GALLEGOS RANCH NEAR CAPULIN
LITSPGCO	LITTLE SPRING CREEK AT MEDANO RANCH NEAR MOSCA
LOSORTCO	LOS PINOS RIVER NEAR ORTIZ
MAJVILCO	MAJOR CREEK NEAR VILLA GROVE
NCLCONCO	NORTH CLEAR CREEK BELOW CONTINENTAL RESERVOIR
NOCRESCO	CRESTONE CREEK, NORTH NEAR CRESTONE
NORDLSCO	NORTON DRAIN NEAR LA SAUSES
NORDSSCO	SOUTH CHANNEL NORTON DRAIN DITCH NEAR LA SAUSES
NORLASCO	NORTH CHANNEL CONEJOS RIVER NEAR LASAUSES
PINDELCO	PINOS CREEK NEAR DEL NORTE
PRWDITCO	PINE RIVER WEMINUCHE PASS DITCH AT WEMINUCHE PASS
RIOALACO	RIO GRANDE RIVER AT ALAMOSA
RIODELCO	RIO GRANDE NEAR DEL NORTE
RIOLINCO	RIO GRANDE AT RIO GRANDE-ALAMOSA COUNTY LINE
RIOLOBCO	RIO GRANDE NEAR LOBATOS
RIOMILCO	RIO GRANDE AT THIRTY MILE BRIDGE
RIOMONCO	RIO GRANDE AT MONTE VISTA
RIOSFKCO	SOUTH FORK RIO GRANDE RIVER AT SOUTH FORK
RIOTRICO	RIO GRANDE RIVER ABOVE THE MOUTH OF TRINCHERA CREEK
RIOWAGCO	RIO GRANDE RIVER AT WAGONWHEEL GAP
RITCRECO	RITO ALTO CREEK NEAR CRESTONE
SAGSAGCO	SAGUACHE CREEK NEAR SAGUACHE
SANCRECO	SAN ISABEL CREEK NEAR CRESTONE
SANFTGCO	SANGRE DE CRISTO CREEK NEAR FT. GARLAND
SANMANCO	SAN ANTONIO RIVER NEAR MANASSA
SANORTCO	SAN ANTONIO RIVER AT ORTIZ
SOUCRECO	SOUTH CRESTONE CREEK NEAR CRESTONE
SOULASCO	SOUTH CHANNEL CONEJOS RIVER NEAR LASAUSES
SPACRECO	SPANISH CREEK NEAR CRESTONE
TABDITCO	TABOR DITCH AT SPRING CREEK PASS
TARBELCO	TARBELL DITCH NEAR COCHETOPA PASS
TREDITCO	TREASURE PASS DITCH AT WOLF CREEK PASS
TRIMTNCO	TRINCHERA CREEK ABOVE MOUNTAIN HOME RESERVOIR
TRISMICO	TRINCHERA CREEK BELOW SMITH RESERVOIR
TRITURCO	TRINCHERA CREEK AB. TURNER'S RANCH
UTEFTGCO	UTE CREEK NEAR FORT GARLAND
WCSDITCO	WILLIAM'S CREEK-SQUAW PASS DITCH AT SQUAW PASS
WEMDITCO	WEMINUCHE PASS DITCH AT WEMINUCHE PASS
WFKMOUCO	WIGHTMAN FORK AT MOUTH AT ALAMOSA RIVER
WFKCROCO	WIGHTMAN FORK BELOW CROPSY CREEK NEAR SUMMITVILLE
WILCRECO	WILLOW CREEK NEAR CRESTONE

DIV IV

CODE	NAME
ABCLATCO	ABC LATERAL
GUNREDCO	GUNNISON RIVER BELOW REDLANDS DIVERSION DAM
MUDAPRCO	MUDY CREEK ABOVE PAONIA RESERVOIR
MUDBPRCO	MUDY CREEK BELOW PAONIA RESERVOIR
RLCGRJCO	REDLANDS CANAL NR GRAND JUNCTION
SOUCANCO	SOUTH CANAL NR MONTROSE
UNCUPSCO	UNCOMPAGRE RIVER UPSTREAM OF SOUTH CANAL
UNCBRGCO	UNCOMPAGRE RIVER AT UNCOMPAGRE ROAD BRIDGE
UNCOLACO	UNCOMPAGRE RIVER NEAR OLATHE

DIV V

CODE	NAME
BLUNINCO	BLUE RIVER AT HIGHWAY 9 BRIDGE
CHAGULCO	CHAPMAN GULCH NEAR NAST
CRYDOWCO	CRYSTAL RIVER AT DOW FISH HATCHERY NEAR CARBONDALE
FRYIVLCO	FRYINGPAN RIVER NEAR IVANHOE LAKE
FRYMERCO	FRYINGPAN RIVER AT MEREDITH
FRYNFNCO	NORTH FORK FRYINGPAN RIVER NEAR NORRIE
FRYSFUCO	SOUTH FORK FRYINGPAN RIVER AT UPPER STATION
FRYTHOCO	FRYINGPAN RIVER NEAR THOMASVILLE
IVCRNACO	IVANHOE CREEK NEAR NAST
ROABMCCO	ROARING FORK RIVER BELOW MAROON CREEK NEAR ASPEN
ROAFRYCO	ROARING FORK RIVER ABOVE MOUTH OF FRYINGPAN RIVER NEAR BASALT
RFCMERCO	ROCKY FORK CREEK NEAR MEREDITH
SNAKEYCO	SNAKE RIVER AT KEYSTONE
WSDRAVCO	WEST DIVIDE CREEK NEAR RAVEN

DIV VI

CODE	NAME
ILLRANCO	ILLINOIS RIVER NEAR RAND
MICMERCO	MICHIGAN RIVER NEAR MEADOW CREEK RESERVOIR
MICWLDCO	MICHIGAN RIVER NEAR WALDEN
MORBSCCO	MORRISON CREEK BELOW SILVER CREEK
PTCKSLCO	POT CREEK AT UTAH-COLORADO STATELINE NEAR VERNAL
WILBSLCO	WILLOW CREEK BELOW STEAMBOAT LAKE
WLTNCKCO	WALTON CREEK NEAR STEAMBOAT SPRINGS
WMFKHMCO	WILLIAMS FORK AT MOUTH NEAR HAMILTON
YAMABVCO	YAMPA RIVER ABOVE LAKE CATAMOUNT

DIV VII

CODE	NAME
ANIHOWCO	ANIMAS RIVER NEAR HOWARDSVILLE
BLADIVCO	BLANCO DIVERSION NEAR PAGOSA SPRINGS
CHEREDCO	CHERRY CREEK AT THE MOUTH NEAR RED MESA
DOLBMCCO	DOLORES RIVER BELOW MCPHEE RESERVOIR
DOLTUNCO	DOLORES TUNNEL OUTLET NEAR DOLORES
ENTDDITCO	ENTERPRISE DITCH AT THE COLO-NEW MEXICO STATELINE
FLOALECO	FLORIDA RIVER ABOVE LEMON RESERVOIR NEAR DURANGO
FLOBLECO	FLORIDA RIVER BELOW LEMON RESERVOIR
LAPHESCO	LA PLATA RIVER AT HESPERUS
LAPMEXCO	LA PLATA RIVER AT THE COLORADO/NEW MEXICO LINE
LITOSOCO	LITTLE NAVAJO RIVER BELOW LITTLE OSO DIVERSION DAM NEAR CHROMO
LONREDCO	LONG HOLLOW AT THE MOUTH NEAR RED MESA
LOSODVCO	LITTLE OSO DIVERSION NEAR CHROMO
LPCDITCO	LA PLATA AND CHERRY CREEK DITCH NEAR HESPERUS
MANMANCO	MANCOS RIVER NEAR MANCOS
MVIDIVCO	LONE PINE CANAL BELOW GREAT CUT DIKE NEAR DOLORES
NAVBNACO	NAVAJO RIVER AT BANDED PEAKS RANCH NEAR CHROMO
NAVOSOCO	NAVAJO RIVER BELOW OSO DIVERSION DAM NEAR CHROMO
OSODIVDO	OSO DIVERSION NEAR CHROMO
PINDITCO	PINE RIDGE DITCH NEAR HESPERUS
PIODITCO	PIONEER DITCH AT THE COLORADO-NEW MEXICO STATELINE
RIOBLACO	RIO BLANCO BELOW BLANCO DIVERSION DAM NEAR PAGOSA
RIOMOUCO	RIO BLANCO AT THE MOUTH NEAR TRUJILLO